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CARL W. WALDRON, M.D., D.D.S., EDITOR
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PROSTHETIC RESTORATION OF CONGENITAL AND ACQUIRED DEFORMITIES OF HARD AND SOFT PALATE

V. H. Kazanjian, M.D., D.M.D.,
Boston

Deformities of the maxilla do not occur frequently, but they vary so greatly that it is difficult to classify them. They may be of congenital or acquired origin. The principal congenital deformity is the cleft palate. Deformities of acquired origin are caused by the destruction of a section of the palate which may result in the loss of the hard or soft palate or they may be associated with the loss of a part of the face such as the nose, orbit, or lip. The usual cause of these deformities is injury, such as gunshot wounds and various accidents, or operative treatment of disease or malignant tumors. Repair of these deformities often may require surgical as well as prosthetic measures. In this paper, certain surgical procedures will be mentioned but the emphasis will be placed on the prosthetic problems. In order to appreciate fully the importance of coordinated treatment by surgery and prosthesis, it is necessary for the prosthetist to have a working knowledge of the problems of surgery in order to construct the appliances intelligently. Likewise, the surgeon must know the possibilities and mechanical principles of appliances in order to harmonize the surgical technic with the prosthetic procedures in a given case.

Cleft Palates

It is not my intention to cover extensively the subject of prosthetic appliances for congenital cleft palate. As is well known, a generation or two ago there was con-

siderable disagreement among the surgeons and prosthetists as to the relative value of surgery and prosthesis. Men like Kingsley condemned in unqualified terms the surgical approach to the treatment of cleft palate; and with good reason. The contemporary results of operation for cleft palate were rather disappointing, whereas most children who had been supplied with prosthetic appliances could learn to speak. However, the surgical treatment of cleft palate has left the experimental stage, and every child is given the opportunity to benefit by operation.

At the present time, the types of obturators designed by the pioneers, Kingsley, Claude Martin, Case and Baker, are used rarely, because surgical procedures have developed sufficiently to provide a child with a long, mobile velum. However, for several reasons, demand for a new type of prosthetic procedure gradually began to be felt. In cleft palate repair, as in other surgical procedures, there are failures and partial successes. When this is the case, the symmetrical outline of the bifurcated soft palate does not exist as it does in cleft palates that have not been operated on. Instead, there may be a closed palate with a large nasopharyngeal space caused by the shortness of the soft palate. In the event of complete surgical failure, there is either loss of soft tissue or cicatricial scars and adhesions of the nasopharyngeal muscles. It has been noticed that the maxillae of patients with cleft palate fail to develop, even after successful operations have been performed in infancy. This lack of development results in a retrusion of the upper middle half of the face and gross irregularities of the teeth.

Although some of the foregoing conditions, such as elongation of the palate for the reduction of the nasopharyngeal space, are susceptible to surgical correction, irregularities of the teeth must be corrected by orthodontic means. There is a broad field for the construction of special appliances, perhaps supplemented by surgery, to improve facial appearance and speech.

Construction of Artificial Palates

Before describing the details of construction, it is essential to emphasize a few principles. In making an obturator, we are attempting to fill the gap between two parts of the soft palate so as to allow normal function; to form a valve for closing the nasopharyngeal space during swallowing and speaking. If this space were surrounded by immobile tissues the construction of an obturator would be simple; but since the cleft is surrounded by palatal and pharyngeal muscles which are in motion constantly during speech, any appliance must be shaped to conform to the complex movement of these muscles.

Many ingenious appliances have been developed in the past. A detailed description of them is likely to lead to confusion, but close examination will show that they are patterned after two distinct mechanical principles. One type is designed to be under the immediate control of the muscles of the soft palate. Such appliances respond to the delicate movements of these muscles and usually are made of velum rubber, vulcanite rubber or gold and are attached to the denture by a hinge, slot or ball and socket joint. The second type is designed as a stationary appliance projecting from the posterior end of the denture into the pharyngeal space. These are stationary but are shaped so that the muscles of the palatal and pharyngeal groups are always in contact with the lateral and posterior surfaces of the appliance in their various movements.

Experience in the construction of flexible and rigid appliances and observation for many years of the work of numerous foreign and American authorities have convinced me that success depends less on the design employed than on the accuracy of

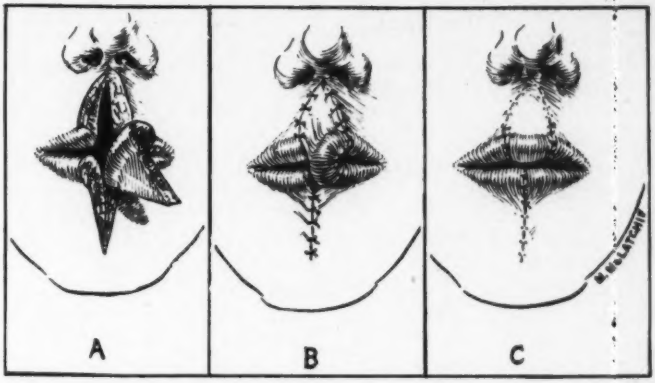

Fig. 1.—The various steps in the Estlander-Abbe operation

adaptation to the patient under consideration. Movable or stationary appliances are mechanically and physiologically practical if applied to the correct case according to the indications.

Each type has certain drawbacks. The movable appliances cause less strain on the denture and retaining teeth; but, being connected to the denture or having some similar attachment, they are apt to leak at that point of contact because of the possibility of escape of air. Moreover, the hinges may require frequent repair and their accuracy is diminished. Stationary appliances are simpler and more durable but exert greater leverage; and, as a result, the teeth holding the appliance are under a greater strain. For that reason they are not indicated for patients without enough sound teeth to retain the denture.

Correction of Retrusion of the Upper Jaw and Lip

Many patients with cleft palate have definite retrusion of the upper jaw caused by the undervelopment of the maxilla. For children we advise intelligent orthodontic treatment. If this procedure is handled properly the results are astonishingly good when the child matures. However, for many reasons, it is not always possible to carry out this ideal type of treatment. As a result we often see a marked deformity of the upper lip in young adults, more from lack of underlying support than from lack of good early operation. It is not always practical to resort to orthodontic treatment at this stage, but construction of an appliance that will be highly satisfactory from a cosmetic as well as a functional point of view is possible. For a patient of this type, with marked deformity of the upper jaw, the plan of procedure would be to sacrifice some of the distorted anterior teeth and construct an appliance, retained by the remaining teeth, incorporating fullness equivalent to that of a normal denture. Of course, such a denture cannot be worn unless a space is provided along the buccal alveolar process. Occasionally we undermine the anterior surface of the alveolar ridge and the canine fossa and apply a skin graft within the oral cavity. If the patient has a well developed upper lip this procedure is sufficient to give a pleasing contour.

Many operations on the lip appear satisfactory from a surgical point of view, but results fall far short of approximating the contour of a normal lip as the child grows older. One of the reasons for this is the lack of proper support from the alveolar bones,

resulting in shrinkage of the lip tissues. The uneven outline of the vermilion border is another definite departure from the normal lip. Most of these patients have overdevelopment of the lower lip; and under close examination we find that the overdevelopment of the lower lip is as unnatural as the underdevelopment of the upper lip.

Since 1930, I have adopted the Estlander-Abbe operation with very pleasing results. This operation consists of the transfer, in two stages, of a measured triangular flap from the midline of the lower lip to the upper lip. The operation results in a decrease in the size of the lower lip to approximately normal and an increase in the size of the upper lip. The operation may be performed on adults under local anesthesia. In addition, the results allow ample room for reception of a denture (Fig. 1). A: The two halves of the upper lip are separated, and existing scar tissue is excised. The separated parts then assume a more normal position. A triangular raw area in the center is to be filled by a flap from the lower lip. B: A measured section in the median part of the lower lip is cut through, care being taken not to injure the coronary artery on one side. The incision may safely be carried to the mucocutaneous line. C: This flap is rotated and sutured to fill the gap in the upper lip. Two weeks later, the connecting bridge of tissue is cut and the parts are sutured in their proper position. Remarkable changes in facial contour may be accomplished with this procedure.

Acquired Deformities of the Maxilla

As mentioned earlier, acquired deformities of the maxilla may be caused by injury or disease or by operative treatment for the control or eradication of malignant disease.

The resulting deformities vary greatly, depending on the extent of the destruction caused by the injury or disease. Loss of the alveolar ridge or palate may be limited to a small perforation ½ inch in diameter, or it may be so extensive as to involve the greater part of the palate. Between these two extremes are many variable deformities. I had one patient whose entire hard palate was destroyed, two who had lost half of the maxilla plus a section of the soft palate and one who had lost the entire upper jaw to the extent that the base of the skull formed the roof of the mouth.

Traumatic cases rarely show great loss of soft palate tissue, but adhesions and cicatricial bands as well as stenosis of the nasopharynx are sometimes seen. Except in cases caused by ulcerative diseases such as syphilis and tuberculosis, operative treatment is usually successful.

Immediate Dentures

Unfortunately, patients with large defects of the maxilla usually are sent to the prosthetist long after performance of the original operation for excision of malignant lesions. Therefore, in addition to the defect of the maxilla, contraction of soft tissue may offer an additional obstacle to the successful construction of a prosthesis. For many years, I have advocated the use of immediate dentures that have been prepared prior to the operation. I realize that this is not always possible, but a temporary denture can be made within a week after the operation, so that there will be less contraction of the surrounding soft tissues of the lips and cheeks while the wound is healing. Such a temporary appliance can be made by modifying the patient's old denture or by taking an impression of the mouth, even though the wound is unhealed, and constructing a base plate. Modifications may be made until the mouth is ready to receive a permanent appliance.

Use of an immediate denture which covers the defect adds to the patient's comfort

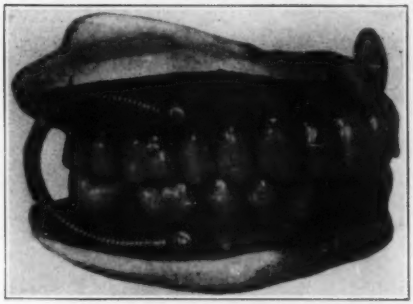

Fig. 2.—Spiral spring formerly used to hold dentures in position

by lessening his difficulty in speech and in eating and by preventing many of the secondary contractions and adhesions of the soft tissues. However, the immediate denture will not always prevent secondary contraction if the raw area is extensive enough to cover the cheek. In this event the surgeon is obliged to resort to skin grafting either immediately after the operation or at a later period.

Methods of Retention

Before discussing the individual types of prosthetic restoration, I should like to outline the methods of retention. Obviously, the loss of part of the maxilla coupled with loss of teeth creates an obstacle to stabilization. For the retention of such dentures we must utilize the remaining part of the alveolar ridges and palate and the remaining teeth, extend the denture into various spaces formed by the perforation and employ various spring attachments extending from the lower jaw to the upper denture.

The contact between the surface of the denture and the palate and alveolar ridges may not be sufficient to retain the denture, but it affords stability, anchorage and an increase of the masticating power if other means of anchorage are sufficient. Because teeth are the most dependable means for the anchorage it is important to save the existing teeth and use light, resilient clasps.

Spaces leading to the nasal cavity are next in importance as means of retention. This means, if used wisely, has a wide range of application. It is desirable, however, to survey the entire area and make the projections of the denture harmonize with the laws of leverage and with the existing conditions of the soft tissues. Projections of the denture may be extended above the posterior border of the palate, toward the nasopharyngeal space; laterally into the cavity of the maxillary sinus, utilizing especially the anterior wall, and anteriorly into the floor of the nose toward the base of the nostrils. In some instances it may be necessary to operate again in order to create a favorable space for the successful retention of a denture. In this respect it may be advisable to incise adhesions of the mucous membrane and apply a skin graft within the oral cavity or nasal spaces to give a better membranous lining for the toleration of the denture.

Spiral springs are used rarely at the present time, but for the sake of the record I will mention two types.

The oldest and most generally used spiral spring is made of special gold wire about $\frac{1}{16}$ inch in diameter and 2 inches long. It is attached on each side of the upper and

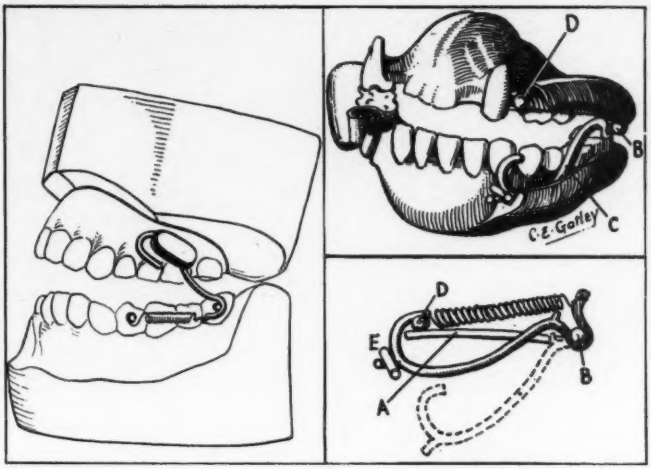

Fig. 3.—Left: Spring attached to anterior button at one end and to short arm of lever at the other end in post molar region. Posterior button acts as fulcrum to lever. Right: Spring and lever attachment which may be reversed to allow lever to slide in a groove on buccal aspect of lower denture. If this method is used, it is necessary to have a catch (E) to act as a bite guide

lower dentures, at or about the first bicuspid region, by means of suitable buttons. These springs rest upon grooves made on the buccal side of the dentures. When the teeth are in close contact the spring assumes a semicircular position (Fig. 2).

The second type, which I devised in 1913, consists of a horizontal spring connected with a lever. Two buttons are attached to the lower plate or bridge, one at the bicuspid region and the other at the third molar region as seen in Figure 3. A horizontal spring is attached to the anterior button at one end and to the short arm of a lever at the other end. The posterior button acts as a fulcrum to the lever. The long arm of the lever fits into a groove made on the buccal aspect of the upper plate. As the patient opens and closes the mouth the tension of the spring keeps the denture in position.

Spring attachments have many drawbacks. Unless they are made accurately and their strength is measured carefully they do not serve to good purpose. They need frequent repair, are not easy to keep clean and at best afford but a limited degree of stability to the dentures. For these reasons, their use should be limited to those cases in which all other means have failed.

Another method of retention of dentures is indicated if the patient has lost the nose or orbit as well as part of the palate. A nasal or orbital prosthesis must be constructed. It is advisable to make an attachment to connect the external prosthesis to the denture.

One of the most common defects is loss of one entire side of the palate and alveolar ridge. If the patient has a sufficient number of teeth on the other side of the maxilla, these may be utilized with an extension of the denture either posteriorly or laterally toward the nasal spaces. Unfortunately, most patients who undergo operative treatment for malignant disease of the maxilla are edentulous. However, it is possible to

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Fig. 4.—Left: Excessive nasopharyngeal space which caused defective speech is shown. Right: Appliance in position

construct a denture which they are able to use with comfort by utilizing the existing healthy part of the palate combined with extensions of the denture to the nasal spaces.

An attempt has been made to describe certain major deformities of the upper jaw and palate and to discuss the problems associated with the restoration of function. I have tried to show that there is a surgical as well as a prosthetic problem, but my purpose has been to discuss the prosthetic problems and the methods for their solution that I have adopted during many years of practice. Because I have not discussed in detail the surgical operations necessary to make prosthesis possible does not mean that the operations are of secondary importance. As previously stated, it is necessary for the prosthetist to have an appreciation and working knowledge of coordinated surgical and prosthetic treatment. The surgeon also must know the possibilities and mechanical principles of appliances in order to harmonize the surgical technic with the prosthetic procedures in a given case.

Case 1

History.—A woman, aged 24, with a complete harelip and cleft palate had been operated on in childhood.

Examination.—Her palatal arch was well developed and the teeth were in excellent condition. The soft palate had been operated on successfully but it was quite short, as is the case in many repaired cleft palates (Fig. 4), resulting in a speech defect. She had a large nasopharyngeal space. To compensate for this she had been trained to use the muscles of her lips in an active and unnatural manner (a condition seen in many cleft palate patients who have had speech training lessons).

It was obvious that the shortness of the soft palate was responsible for the defect in the patient's speech. The problem in this case was whether to operate and elongate the soft palate or to construct an appliance to correct its deficiency.

Procedure.—The appliance made for this patient consisted of a metal base plate with a hinged joint attached to the posterior border. From this joint extended a bar which held a soft rubber obturator (Fig. 5). The anterior and lateral borders of the obturator fitted and slightly overlapped the nasal surface of the soft palate, while the contour of the posterior border harmonized with the movements of the muscles of the posterior pharyngeal wall (Fig. 6). Eventually the soft rubber obturator was replaced by an acrylic one.

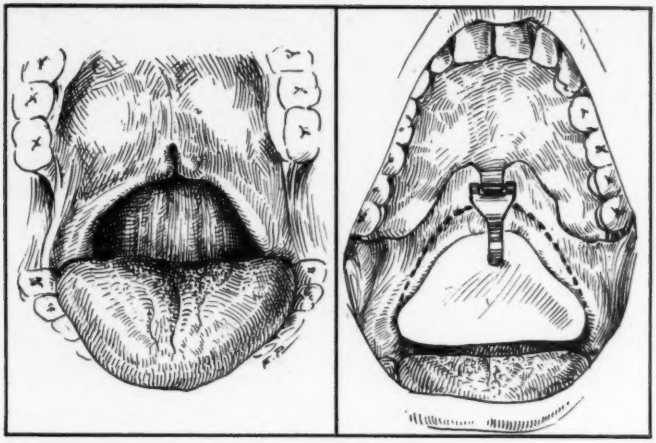

Fig. 5.—Posterior border of metal base plate carries a hinged joint to which a soft rubber obturator is attached

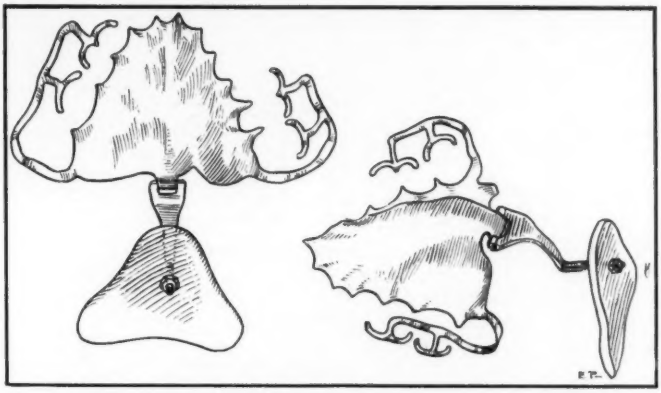

Fig. 6.—Appliance used to close excessive nasopharyngeal space

Remarks.—It has been my experience that the successful construction of an appliance for a patient with a short velum is more difficult than for a patient with a bifurcation of the soft palate. The reason is that the appliance must be under complete control of the soft palate in order to harmonize its movements with those of the soft palate. Such an appliance should be of the hinged type. Rigid appliances for patients with this defect do not give much improvement in speech.

Case 2

History.—The patient had a congenital harelip and partial cleft of the palate. The lip had been operated on in infancy, but the palatal defect had been covered for many years with a denture supplied with an obturator.

Examination.—I first saw this patient in 1920, when she reported for the construction of another appliance. Examination showed a partial cleft involving the soft palate and part of the

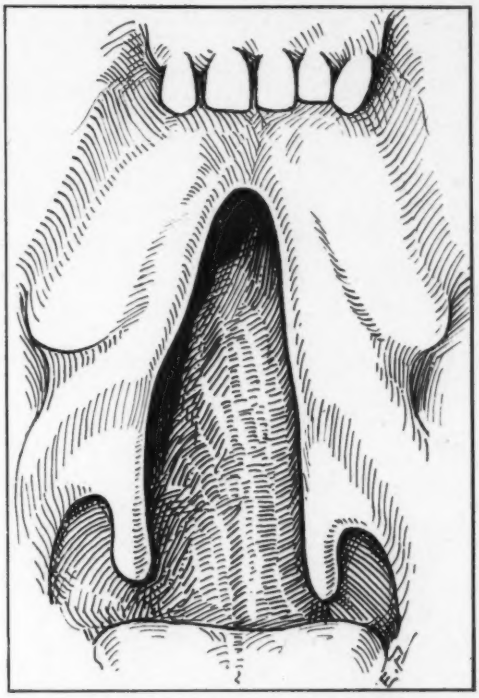

Fig. 7.—Partial cleft of palate. The patient had lost all posterior teeth, and only five anterior teeth remained for retention of denture

hard palate. The maxillary arches were well developed and the teeth were in good occlusion. Her speech was perfect after some modifications were made in her appliance.

Procedure.—Gradual loss of all her posterior teeth presented a serious problem for the retention of the denture with an obturator which naturally exerted considerable leverage (Fig. 7). The problem was solved by utilizing the existing anterior teeth to their best advantage and by a posterior extension of the denture over the nasal floor (Fig. 8, left). In order to introduce the prosthesis into the mouth and over the edge of the cleft it was necessary to make clasps consisting of a lingual resilient bar which fitted the palatal side of the cuspids and a gold wire clasp (about 1 inch long), the anterior end of which fitted the buccal surface of the cuspids while the posterior end was attached to the second molar region of the denture. These hinged buccal parts of the clasps ran in a somewhat downward, diagonal direction when the denture was introduced into the mouth. Once in position they were raised over the cuspid teeth. The small vertical hook on the side of the denture helped to hold the clasps to the teeth and prevented undue strain on the hinge.

The obturator was of the mobile type and was attached with a semicircular hinge to prevent escape of air through the joints (Fig. 8, right).

Case 3

History.—The patient, a man aged 23, had a congenital bilateral harelip and cleft palate and had been operated on in childhood. Considerable infection had developed and, as a result, the patient had a marked deformity when he reached maturity.

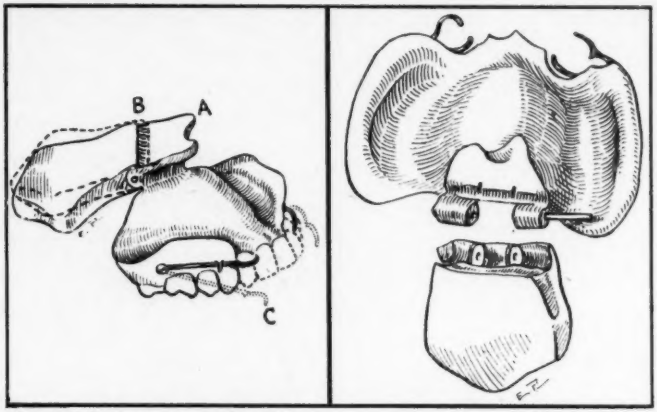

Fig. 8.—Left: A: Extension of denture over nasal floor. B: Type of hinge attachment which prevents possible escape of air. C: Type of resilient clasp. Extension at A and clasp at C hold denture securely in position. Right: Note type of hinge used to prevent escape of air. Circumference of hinge is almost 1 inch

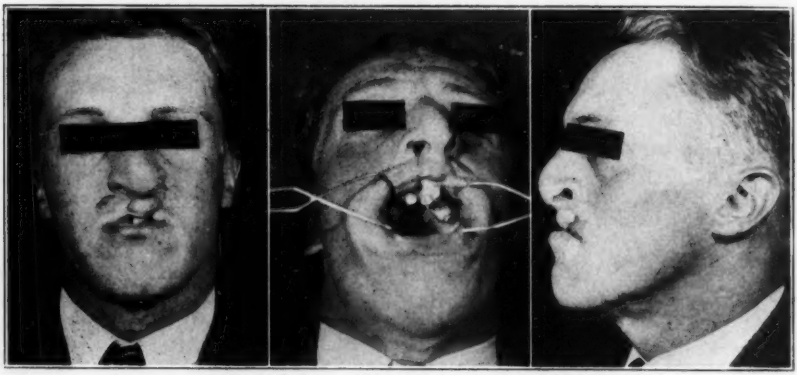

Fig. 9.—Patient showing retracted and distorted upper lip and extent of cleft. Surgical repair was not possible because of loss of tissue

Examination.—The upper lip was tense and the median portion was adherent to the alveolar ridge. The scars were depressed and conspicuous, and the vermilion border was uneven. The teeth were badly decayed. A wide cleft of the palate was surrounded with dense adherent scar tissue (Fig. 9).

Treatment.—The badly decayed and misplaced anterior teeth were extracted, leaving only three posterior teeth to help retain a denture. After the contour of the contracted upper lip was improved by an Estlander-Abbe procedure (see Fig. 1), rhinoplastic repair was made to improve the nasal contour. It was apparent that operation to reform the palate would not be practical because of the great loss of tissue after previous unsuccessful operations.

When the patient was ready for construction of a denture he had only three teeth in the upper jaw (Fig. 10). The cleft was wide, and the soft palate was devoid of muscular action because of loss of tissue. An artificial appliance was made to provide adequate fullness to the upper lip. A rigid type of obturator was attached to this appliance (Fig. 11).

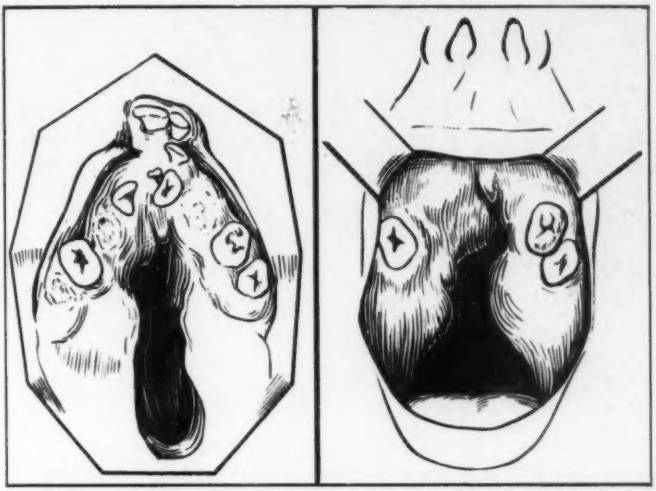

Fig. 10.—Extent of cleft before and after extraction of misplaced anterior teeth

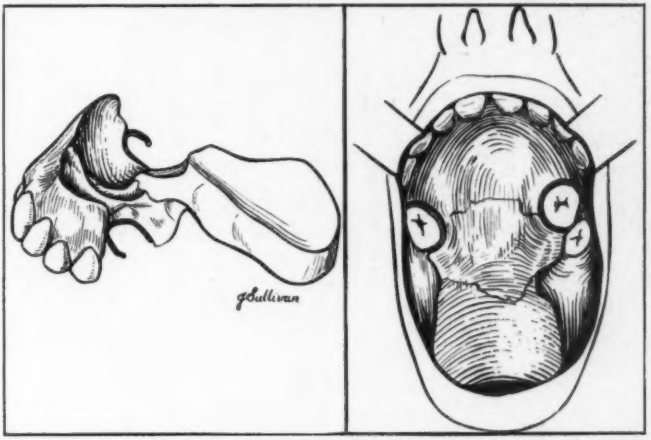

Fig. 11.—Stationary type of appliance extending from posterior end of denture into pharyngeal space. Obturator is stationary but is so shaped that muscles of palatal and pharyngeal groups are always in contact with lateral and posterior surface of appliance in various movements

By operative as well as by prosthetic procedures the facial appearance was improved. There was greater fullness of the upper lip (Fig. 12). The denture provided adequate teeth for mastication and the artificial palate improved the patient's speech materially, although it was far from perfect.

Remarks.—Adult patients with congenital defects of the palate and resulting speech defects have more difficulty in obtaining normal speech tone than patients who have an acquired deformity of the palate. In the latter group, speech improves as soon as the patient is supplied with an artificial appliance.

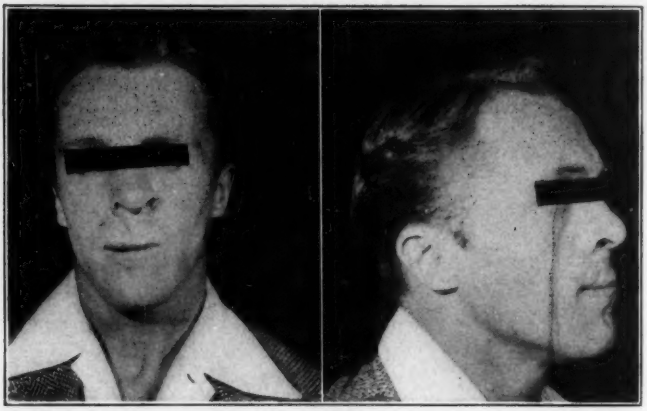

Fig. 12.—Patient as he appears at present

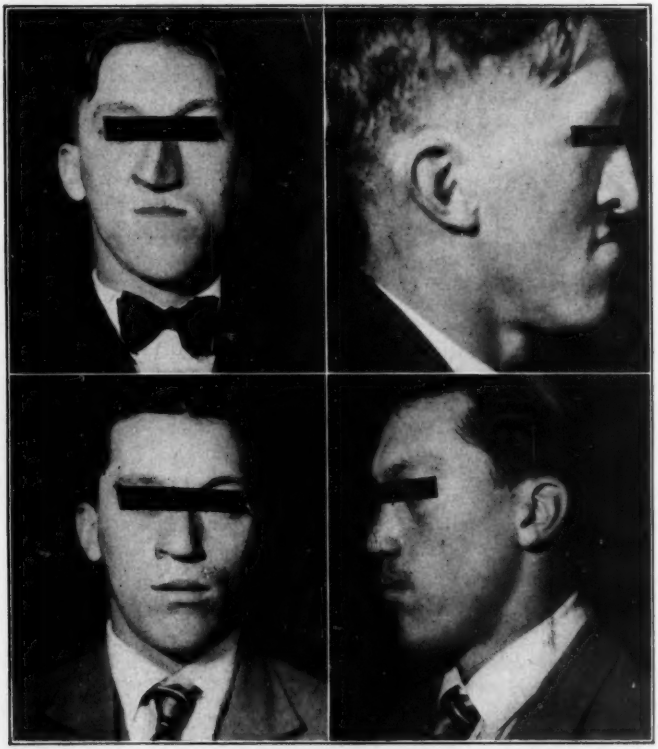

Fig. 13.—Above: Patient showing marked retrusion of upper lip and distortion of nasal contour. Below: Appearance after restoration

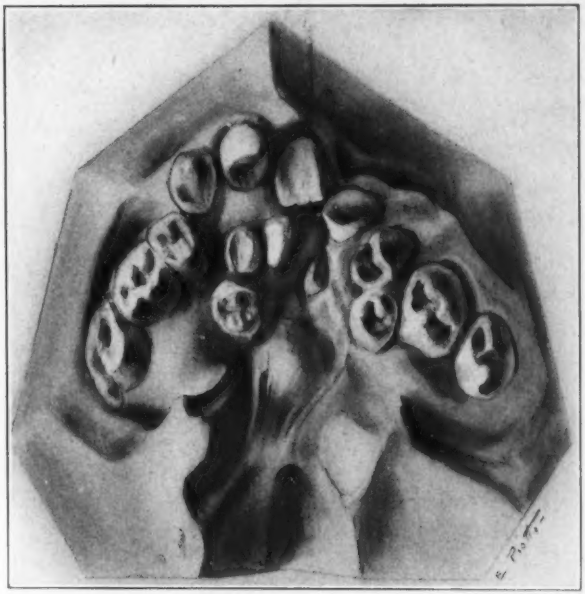

Fig. 14.—Diagram of upper jaw showing marked distortion and misplacement of teeth

Case 4

History.—This patient, a man, aged 19, had been operated on for repair of the palate in early childhood. He had one of the most extensive types of adult cleft palate deformities (Fig. 13).

Examination.—The nose was distorted toward the right side because of the deviation of the nasal bones as well as displacement of the septal and lower lateral cartilage. The upper half of the face, including the lip, was markedly retracted, while the lower part of the face looked unduly prominent. The upper teeth were poorly developed and were scattered over the palate (Fig. 14). The hard palate had lost its normal contour and was covered with scar tissue, while the soft palate had no uvula and was poorly formed and short. The patient's speech, however, was fair.

Treatment.—Treatment of the patient involved many interesting points. It was necessary to correct the impaired breathing and the retraction of the upper lip, and to reconstruct the patient's dental apparatus.

A submucous resection of the septum was performed, after which all malposed teeth in the upper jaw were extracted, leaving only the molars and bicuspids. No effort was made to correct the deformity of the lower part of the nose.

In order to correct the retraction of the upper lip, it was necessary to free the base of the lip of adhesions and to introduce a prosthetic appliance to retain the contour of the lip in its normal position. This temporary appliance was prepared after the first operation.

In the next operation, an incision was made along the buccal fold under the upper lip. With a blunt instrument, the soft tissues under the nose and under the sides of the nose were freely

Case 4 was published previously in *Surg. Gynec. & Obst.* 59:70 (July) 1934. It is included in this article because the author believes it to illustrate well the judicious use of a skin graft in the buccal cavity before construction of an upper denture.

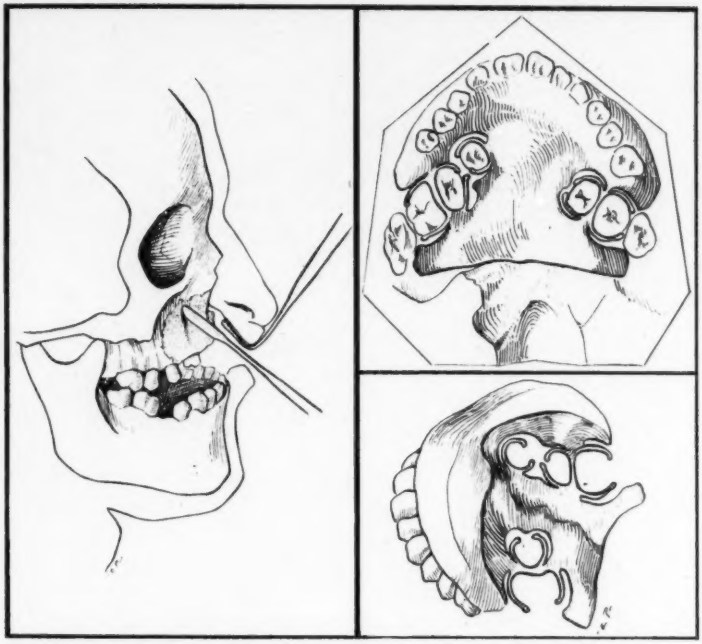

Fig. 15.—Left: Extensive undermining over anterior and lateral buccal aspect of jaw to prepare for application of skin graft. Right: Diagram of permanent denture. Note fulness of denture which acted as framework for upper lip

separated from the periosteum (Fig. 15, left). Dental composition was added to the buccal rims of the temporary denture and fitted to the raw area under the lip. A skin graft was then taken from the thigh and pressed firmly against the denuded area, the denture being used as a splint. The lip was repaired by excision of the scars and a better approximation of the uneven borders. The appliance was not disturbed for a few days. By this time the skin graft had taken, and there was a good space under the upper lip and side of cheek for a permanent prosthetic restoration.

The final operation was performed for correction of the nasal deformity. After the patient's discharge from the hospital a permanent denture was made (Fig. 15, right).

Case 5

History.—A girl, aged 14, was referred to me for an operation on a lesion of the upper jaw. A biopsy specimen had been reported as squamous cell carcinoma, grade 2.

Examination.—There was a swelling on the right side of the hard palate with slight sloughing in the center.

Treatment.—An operation was performed which resulted in a considerable perforation of the right side of the palate (Fig. 16). Because this patient had all her teeth except the molars on the right side, an ordinary denture was made and retained in position with Aker's clasps (Fig. 17). The maxillary right side of this denture extended into the perforation to act as a plug.

Case 6

History.—This patient had been operated on for sarcoma of the upper jaw in 1918, and a large perforation of the palatal wall had resulted. She wore dentures quite successfully while her

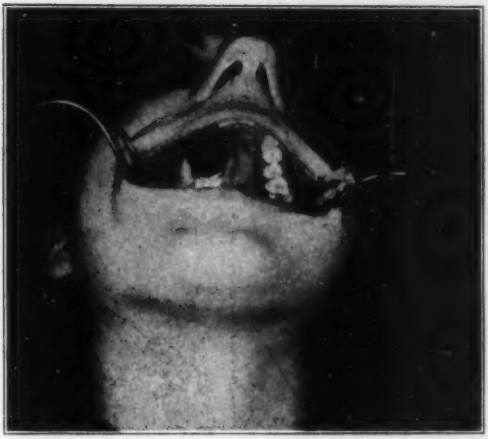

Fig. 16.—Perforation of right side of palate after operation for removal of tumor is shown

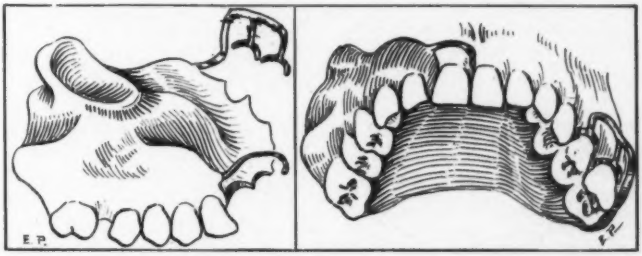

Fig. 17.—Diagram of denture which was retained in position by clasps in left molar region and over central tooth. Retention was accomplished also by extension of denture over nasal surface of perforation, thus giving three point contact for retention

teeth were present but she began to lose her posterior teeth and in 1939 had only three anterior teeth (Fig. 18, left).

Treatment.—The denture was retained in position by utilization of the cuspid teeth as well as the posterior border of the perforated palate (Fig. 18, right). Two clasps grasped the cuspid teeth, but, because of the divergent position of the cuspids, it was necessary to make the buccal flange of the clasp quite flexible for the removal and application of the denture. Therefore, the buccal flanges were attached to horizontal bars fastened to the plate at the molar region. In this way, the long bar of the clasp had sufficient flexibility to overcome the slanting edges of the cuspid teeth. There was also a liberal extension of the upper surface of the denture into the nasal cavity, running toward the nasopharynx. This denture was made in August 1941, and the patient has worn it comfortably since that time.

Case 7

History.—A woman, aged 25, had the entire left half of the maxilla removed. The teeth on the right side, and the left central incisor, all healthy and rigid (Fig. 19, left), were available for the retention of an appliance. The scar tissue from previous operations had caused consid-

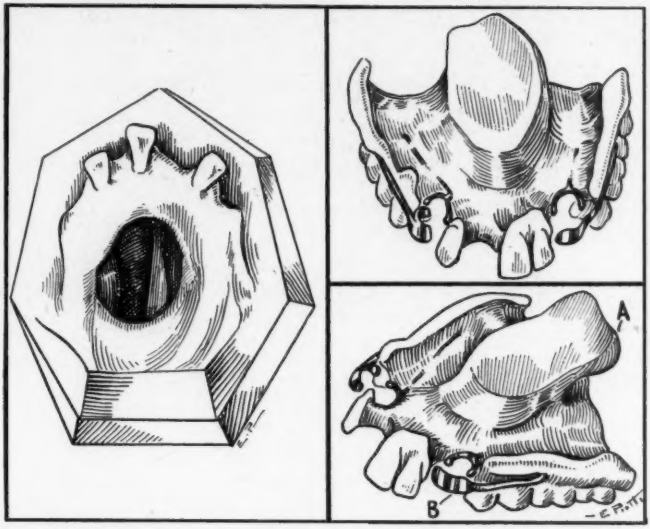

Fig. 18.—Left: Diagram showing large perforation of hard palate after operation for malignant tumor, and presence of three anterior teeth in divergent positions. Right: Appliance used to cover perforation. Note extension of denture over nasal surface (A) and resilient type clasp (B) used over divergent anterior teeth

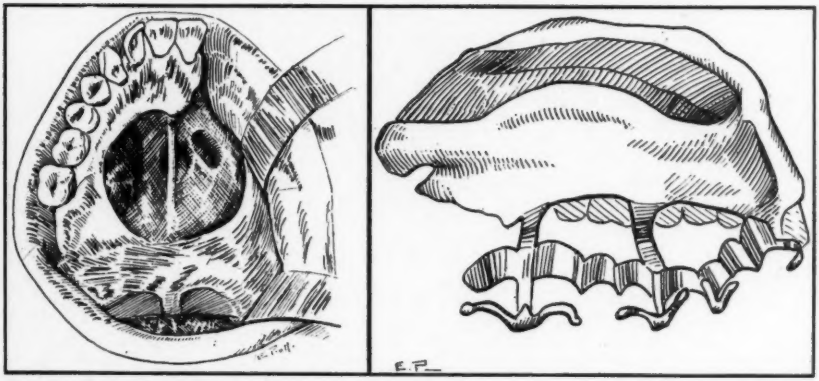

Fig. 19.—Left: Diagram showing large perforation of palate after entire left half of maxilla had been removed. All teeth on the right side were present. Right: Appliance for obtaining retention by continuous lingual clasp with extensions over interdental spaces to buccal surfaces

erable retraction and contortion of the left side of the upper lip and the face (Fig. 20, above). The palatal perforation was not helpful in stabilizing the appliance.

Treatment.—An operation was performed to release the buccal adhesions and to graft skin on the raw areas, in order to improve the facial appearance.

The bulk of the appliance filled the space formerly occupied by the left half of the maxilla, and the artificial teeth were placed in good occlusion. Retention was obtained by a one piece

Fig. 20.—Above: Patient showing retraction of left side of face caused by adhesions within the buccal cavity. Below: Improvement in facial contour

casting. A continuous clasp, with lingual surfaces for all the teeth on the right side and with extensions over the interdental spaces to the buccal surfaces (Aker's type clasps) of these same teeth, was attached to the denture (Fig. 18, right).

The appliance and the operative procedures resulted in marked improvement in function and appearance (Fig. 20, below).

Case 8

This edentulous patient had a mildly malignant tumor in the region of the upper right tuberosity. An operation was performed which resulted in the loss of part of the alveolar ridge and tuberosity on the right side, as well as a perforation a little over ½ inch in diameter (Fig. 21, left). In spite of the perforation and loss of part of the alveolar ridge the patient was able to wear a full upper denture with comfort.

Fig. 21.—Left: Perforation of palate in edentulous patient. The perforation in upper right posterior region was approximately 1 inch by ½ inch in diameter. Center and Right: Full upper denture with good retention has been made

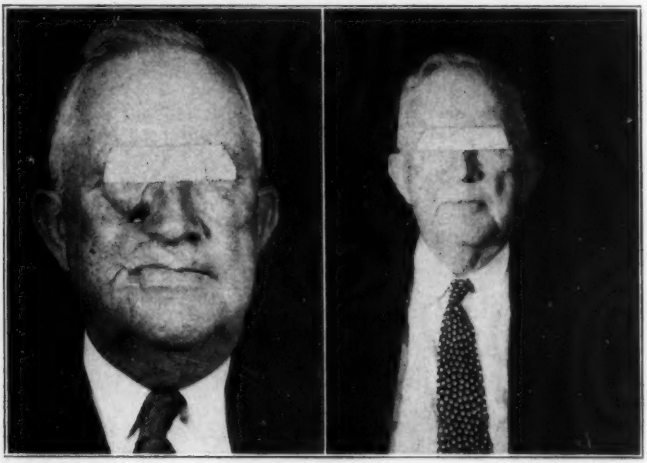

Fig. 22.—Left: This patient had a malignant lesion which involved the greater part of the hard palate, extended to the maxillary sinus and also involved the skin of the face, resulting in an external perforation. Right: Final appearance of patient after extensive reconstruction of side of face after removal of malignant tissue

The appliance did not differ from an ordinary denture except for an extension into the perforation to act as a plug (Fig. 21, center and right).

Remarks.—In working with small perforations of the palate, palatal wall or along the alveolar ridge, it has been my experience that a well fitting denture will give enough retention for successful use, provided the patient has well developed alveolar ridges.

Case 9

History.—An edentulous man, aged 65, had a malignant skin lesion on the side of the face extending toward the right ala of the nose. He had had six radium treatments for the condition sixteen years previously. Six years before I saw the patient, he had a recurrent lesion which was irradiated and apparently cured.

Examination.—On July 22, 1941, there was considerable induration over the right side of

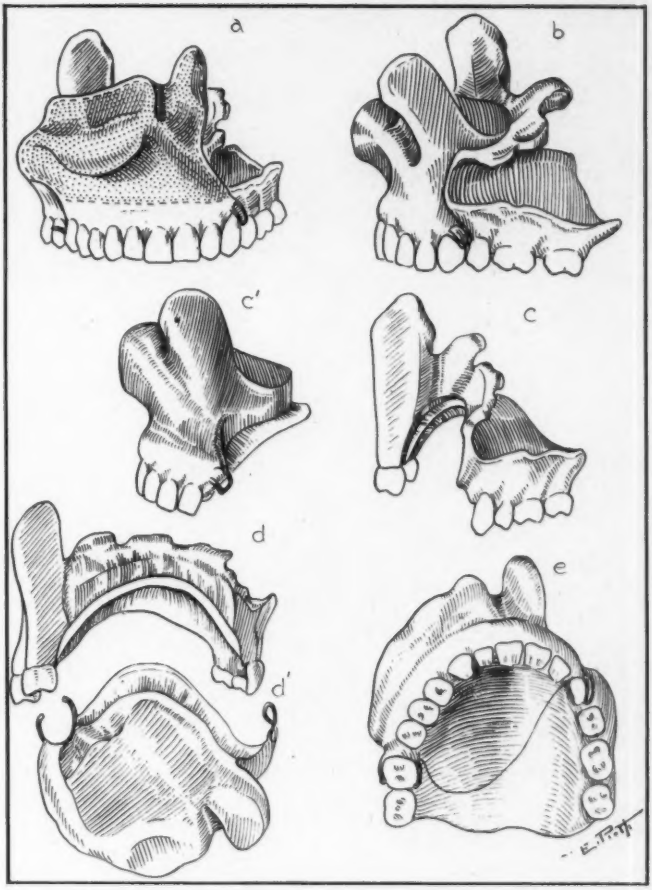

Fig. 23.—Diagrammatic drawing of appliance

the nose with retraction of the right side of the upper lip toward the nose (Fig. 22, left). Oral examination showed an ulcerated area on the buccal fold extending toward the alveolar ridge and palate. Roentgenograms showed considerable absorption of bone.

Treatment.—On July 29, 1941, an operation was performed for the removal of the malignant tissue. It was necessary to excise the greater part of the right half of the maxilla, part of the wing of the nose and the indurated section on the side of the nose. Immediately after the operation dental composition was added to the patient's upper denture, extending into the operative field and toward the nose and maxillary sinus. The patient used this denture until a later date when a new appliance was made.

Two years after the first operation, the patient was operated on again for recurrent cancer at the anterior part of the remainder of the maxilla. Only a small section of the upper jaw on the left side and the entire soft palate remained. The patient has been free from recurrence.

Remarks.—The patient is wearing his denture with comfort. The denture is made in two sec-

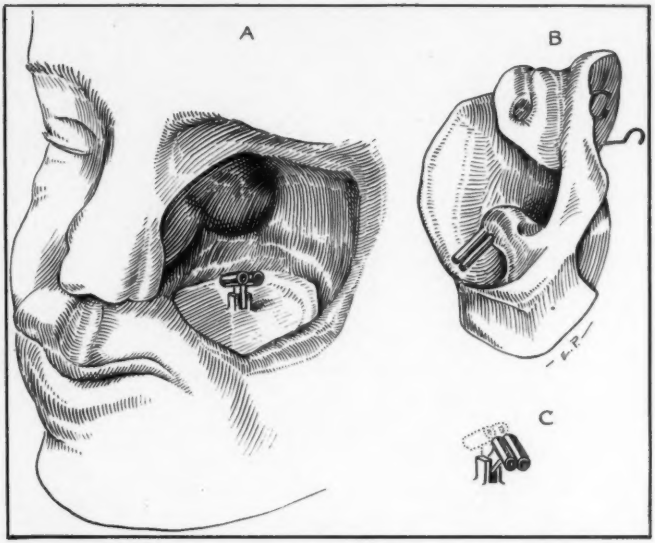

Fig. 24.—Diagram of large maxillofacial prosthesis. On inner surface of facial prosthesis were two parallel wires which fitted into tubes on maxillary prosthesis. The two sections in position supported each other firmly

Fig. 25.—Patient with prosthesis in position

tions which are introduced into the oral cavity separately and are locked together with clasps when in position (Fig. 23).

The appearance of the patient approximately three years after the last operation is shown in Figure 22, right.

Case 10

History.—This patient had been operated on sixteen years previously for extensive carcinoma of the sinuses, orbit and face. The left eye, sinuses, left half of the maxilla and part of the cheek

had been removed. The cicatricial tissues in the buccal cavity had caused limitation in the motions of the mandible.

Treatment.—The patient was able to wear the maxillary and orbital prosthesis with comfort, but within the last year it became necessary to construct a new prosthesis which was made in two sections. The upper surface of the denture was supplied with two horizontal tubes about 1 cm. long. Two parallel wires which fitted into the tubes on the maxillary prosthesis extended from the inner surface of the facial prosthesis. When the two sections were in position they supported each other firmly (Fig. 24). The frames of the spectacles which the patient wore gave additional support.

The facial prosthesis was made of acrylic resin and was painted with celluloid paint to match the color of the surrounding skin (Fig. 25).

Remarks.—This is an example of retention of a prosthetic appliance whereby an orbital-facial restoration may be fastened to a maxillary prosthesis with suitable attachments.—*475 Commonwealth Avenue.*

QUERIES AND ANSWERS

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UMI

REPORT OF TEN YEARS' EXPERIENCE IN TREATING HYPERMOBILITY OF THE TEMPOROMANDIBULAR JOINTS

Louis W. Schultz, M.D., D.D.S.,
Chicago

The temporomandibular joint is unique, the only articulation of its type in the body. Its peculiarities are as follows: (1) it is one of twin joints, located at either end of a horseshoe shaped bone, the mandible; (2) its peculiar construction permits more free motion in all directions than is found in other joints; (3) both joints move through similar pathways when in motion; (4) either one or both condyles may be removed and good function retained; (5) one or both condyles may be fractured and healing permitted with the condyle in any position, yet the resulting function will be practically normal, and (6) the condyles are rather loosely suspended in their sockets.

Definition

Luxation of the temporomandibular joint is its complete dislocation, whereas subluxation means a partial dislocation of the mandible.

Etiology

The most common causes of luxation and subluxation are: yawning, long dental sittings, extraction of teeth, the use of mouth gags, manipulation of the patient's jaw while he is under general anesthesia, singing and sleeping with the head resting on the arm. Recovery, as a rule, does not occur unless and until the damage is adequately repaired.

Symptoms

Hypermobility is an all inclusive term meaning more motion than normal and occurs in both forms of dislocation, complete and incomplete. It can be seen, or felt easily by the palpating finger. When the mouth is opened the head of the condyle passes downward and forward through the normal pathway, continues on, overrides the eminentia articularis and passes out in front and above this structure (Fig. 1).

Pain may be constant or intermittent. It is usually localized in the region of the ear on either or both sides. As a rule the pain is unilateral and occurs when the joint is used. It may be referred to other parts of the head on the same side, for example, the temple or cheek.

Clicking or grating is frequently present during one or all three phases: opening, closing and exertion of pressure, as when the patient is chewing.

In complete dislocation the mouth is opened and cannot be closed by the patient; both sockets are empty, and the displaced condyles may be perceived visibly and also by the palpating finger (Fig. 2, left).

Read at the twenty-ninth annual meeting of the American Society of Oral Surgeons, Boston, July 31, 1947.

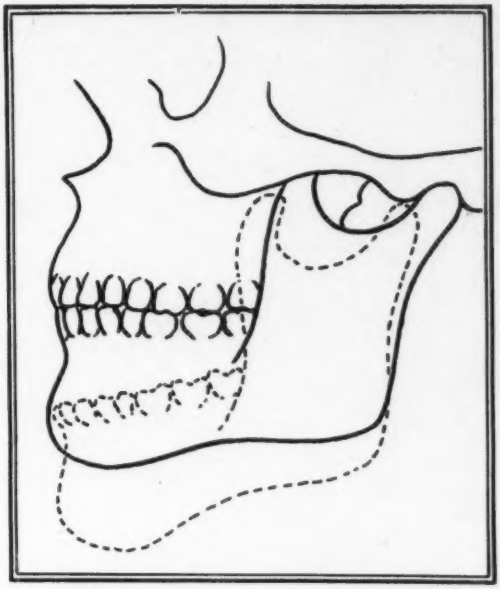

Fig. 1.—Solid line shows outline of mandible. Broken line shows degree of motion possible for subluxating mandible

Locking of the jaws may occur when they are opened in luxation or subluxation. The meniscus or fibrocartilaginous disc is usually responsible for this condition. In such cases it is caught and folded between the head of the condyle and the eminentia articularis. In luxation, locking occurs only when the jaw is open.

Mental complex is a condition seen in many of these patients. The dread of having the jaw dislocated, with locking or extreme pain or both, induces phobia in these unfortunate patients.

Diagnosis

One of the most valuable aids in diagnosis of these dislocations is palpation of the joint. The tips of the index fingers are placed over the temporomandibular joints just anterior to the tragus of each ear and the patient opens and closes the mouth. Gentle palpation will reveal: (1) the joint involved and whether one or both sides are affected, or if both sides are normal; (2) subluxation of one or both sides and to what extent; (3) tenderness over this region when the joint is moved or at rest; (4) grating, popping, or clicking; (5) occurrence of click on opening, closing or pressure, and (6) determination of effectiveness of treatment.

Hypermobility is easily diagnosed. The symptoms as enumerated are characteristic, and the accompanying history reveals the age of the trouble, its progress, the side involved and any other factors relevant to it. The indications for treatment are as previously given: pain, local, constant, or when the joint is moved; clicking or grating; complete dislocation; locking of the jaw in either the opened or closed position, and dolorophobia.

Diagrams used previously for illustrating Treatment by Injection for Subluxation of the Temporomandibular Joint. *D. Digest* 43:493 (September) 1937.

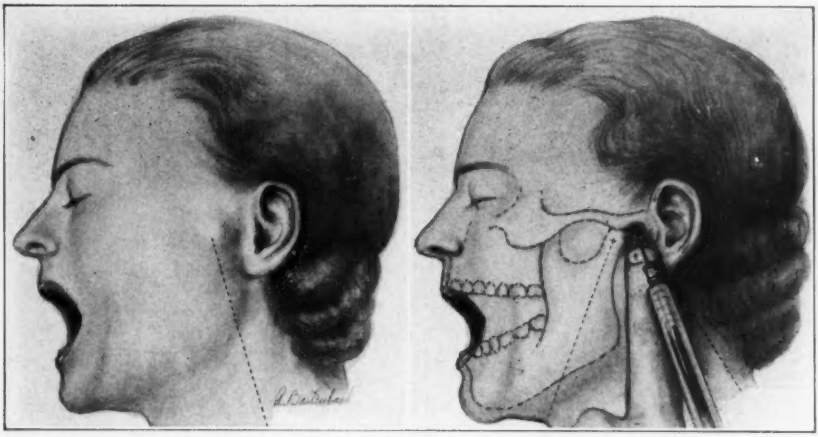

Fig. 2.—Left: Broken line indicates characteristic protuberance caused by head of condyle subluxating from glenoid fossa during open-mouth position. Right: Broken line at left indicates position of head of condyle when it is out of the glenoid fossa. Broken line at right indicates glenoid fossa, site of injection into joint cavity

Contraindications for Treatment

Unfinished dental work should be completed before the joint or joints are treated.

A patient found ready for treatment may come at the appointed time with limited motion and pain in the joint. The joint should not be treated at this time. Very likely an acute sprain has occurred, tearing the capsule and blood vessels and stretching the ligaments. Limitation of motion is nature's splint, as we observe in all acute injuries to the joints. The treatment for such a joint is rest. If acute symptoms disappear in a few weeks the joint should be treated.

Injection of the temporomandibular joint is contraindicated if both articular surfaces, that is, the head of the condyle and the glenoid fossa, are rough, painful and limited in motion and if there is no clicking or grating.

Treatment

If there is doubt that an afflicted joint should be treated, and the decision depends on whether or not the pain is coming from the joint, it is permissible to inject procaine hydrochloride into the joint to allay the pain. If effective, treatment should be started. Or the jaw may be supported by a bandage for several days to determine if this will eliminate the pain. If it does the joint should be treated.

Unilateral subluxation, as a rule, should be treated bilaterally, a little more emphasis being placed on the hypermobile side.

A normal joint whose mate is hypermobile will frequently become similarly affected, and clicking, pain or even locking may occur on both sides. Normal motion of one joint and hypermobility of the other requires treatment of the hypermobile joint only.

I prefer the following drugs for this treatment: Intracaine 5 per cent in oil (B-diethylaminoethyl p-ethoxy benzoate) (Squibb); Eucupin 1 per cent in oil (Isoamylhydropreine) (Rare Chemicals) (This solution must be specially made up), and

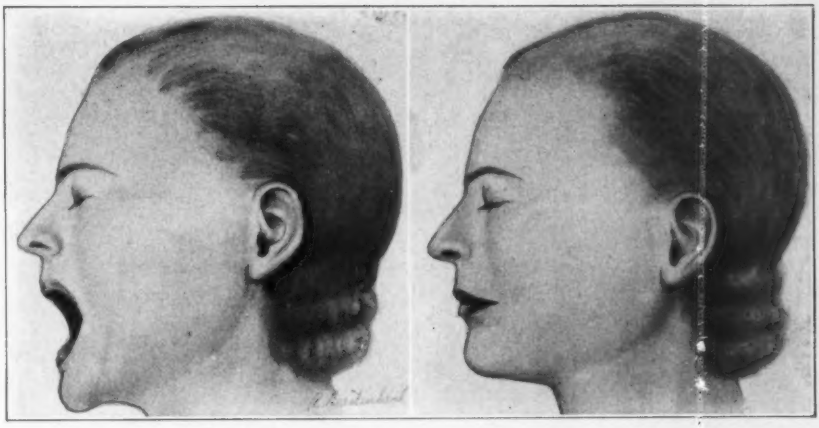

Fig. 3—Left: Postoperative result showing head of condyle remaining in glenoid fossa during open-mouth position. Right: Absence of deformity during closed-mouth position

Sylnasol (sodium psylliate) (a 5 per cent solution of the sodium salts of fatty acids extracted from psyllium seed with benzyl alcohol 2 per cent) (G. D. Searle). This latter drug is considered the most effective of the group in effecting a cure. However, because of its tendency to cause pain in some instances, we are still searching for a completely painless method of treatment.

Injection of Intracaine 5 per cent in oil or Eucupin 1 per cent in oil is painless. The fibrous tissue produced by these two drugs is not as firm as that obtained by the use of sodium psylliate. However, it is adequate, and a good result is usually obtained in the average patient.

Various types of treatment used in the past and still employed by some operators appear to be unsatisfactory. Surgical operation is one. Among its disadvantages and dangers are resultant scars and the rather great physical difficulties encountered in removing the cartilaginous disk. Scarcely less formidable is the placing of mattress sutures in the capsule. Other complications are possible, including facial paralysis on the side involved or a permanent salivary fistula if the parotid gland is injured. The proximity of the external maxillary artery and veins adds to the hazards, and ankylosis may result, caused particularly by infection incident to the operation.

A review of some methods of treatment in use shows a modicum of good in all, although most are quite unsatisfactory. One unsatisfactory method commonly used consists in putting a bandage around the head to immobilize the mandible with the superior maxilla for a period of 1½ to 2 years. The patient is instructed not to open his mouth for large morsels of food but to keep the joint at rest as much as possible. If a click should recur, treatment is repeated for another 1½ to 2 years, together with bandaging to control motion.

The treatment I recommend consists in putting a few drops of a sclerosing agent into the cavities of both joints. This tightens the capsules. To facilitate accuracy, a 1 cc. tuberculin syringe is filled with the solution to be injected, and a 26 gage needle 1½ inches long is adjusted. The skin over the joint is rubbed briskly with an alcohol sponge, and the tip of the index finger of the left hand is dipped in alcohol and used to palpate the structures over the joint. The patient is then asked to open the mouth

until the head of the condyle leaves the glenoid fossa, at which time the needle is inserted (Fig. 2, right). A gentle pull on the piston will bring blood into the syringe if the needle is in a blood vessel. If so, withdraw the needle a short distance and reinsert in another direction. Repeat the test. When no blood appears, the injection is made into the cavity of the joint. It is important that this test be made to prevent the oily drug from entering a blood vessel. Four to eight drops of the Intracaine are injected. The injection is repeated on the opposite side.

Injection is made again in 2 or 3 weeks and is repeated until sufficient fibrous tissue has developed to effect a cure, which is determined by the limitation of the aperture between the upper and lower teeth when the jaw is opened fully. In some cases there is need for but one injection. In others, as many as four to six may be required. The second or third injection is much more difficult to make because the head of the condyle now is in close apposition to the glenoid fossa and does not leave it when the mouth is opened (Fig. 3). Patients suffering most from pain, subluxation and clicking usually obtain the best results as do patients who experience the greatest degree of local reaction after injection.

The injection itself should produce no more discomfort than the prick of the needle followed by a slight feeling of numbness and fullness in the joint. In the majority of cases the patient has no complaint other than some interference with chewing for the remainder of the day on which he receives the injection. The administration of aspirin 10 grains occasionally may be necessary for comfort. The injection may produce a slight feeling of numbness of the side of the face owing to the anesthetic action of the oily solution.

The patient should be cautioned not to yawn or open the mouth wide enough to cause pain, and a bandage should be applied before he goes to sleep to prevent excessive opening of the mouth.

There may be swelling in the region where the injection has been made, which usually lasts three or four days. The bite may be shifted temporarily slightly forward or to one side, depending on the degree of the reaction.

The molar teeth may not come into occlusion because of thickening of the capsule. This effect is also transitory. Very rarely there is salivation for twenty-four to forty-eight hours and some pain if the injection was made too deep, affecting the chorda tympani, that is, if the solution was deposited at the inner table of bone.

The reason for failure of this method of treatment is primarily injection made at the improper site. It is very easy to inject into the external auditory canal; the middle ear; the large blood vessels, or the periarticular spaces.

Allowing a patient to yawn or to produce pain by forcibly opening his mouth after an injection will also tend to destroy the effectiveness of the treatment and should not be permitted.

A temporomandibular joint that is painful on motion and limited in movement, and which roentgenographically shows a roughened area, usually on the anterior portion of the head of the condyle and on the eminentia articularis, is one that should be treated in a manner that will still further limit motion and separate the denuded or roughened areas. In order to aid nature in limiting pain and to promote healing, this restricted limitation should be controlled for a period before allowing the joint to resume its normal excursion, and then only after roentgenograms have shown healing of the roughened surfaces. Painful roughened joints that affect both condyle and glenoid fossa in their entirety, that are limited in motion, and are becoming progressively worse are not benefited by this injection treatment and should be treated surgically.

UMI

The constant irritation produced in a hypermobile joint will cause folding and breaking of the fibrocartilaginous disk, and certain types of tumors may develop. The most common types are sarcomas, osteomas, chondromas, and mixochondromas.

The type of treatment here described permits the operator perfect control of the desirable degree of function and fibrosis. This control is directly proportional to the number of injections given and the quantity of solution injected. The limitation of opening is carried to a degree just sufficient to stop the clicking, grating or subluxation and is held there. Usually one treatment is sufficient with a cooperative patient; two, three or four treatments can and should be given if necessary.

If the patient at any time is not appreciative of the work done for him and would like to regain the condition of his jaws before treatment, a little nitrous oxide should be administered and the patient's mouth opened with a mouth gag. The limitation can be cancelled at any time by this procedure.

The clicking, grating or popping has been controlled so far in all of the several hundred patients who have been under my care. This control is attained during the first six to twenty-four hours. To date there has been no complication or deleterious effect.

Conclusion

This article has been presented to give the profession a clearer conception of the treatment described and its progress, soundness and efficacy. This subject was the basis of a previously published article,[1] but, because several hundred patients have been treated to date, this report is more valuable in proportion to the larger experience gained.

Attention is directed again to the simplicity and safety of the method and to the fact that it may be used in the treatment of other joints in which function is impaired by lax ligaments.—*25 East Washington Street.*

1. Schultz, L. W., A Treatment for Subluxation of the Temporomandibular Joint. *J.A.M.A.* **109**:1032 (September) 1937.

AMERICAN BOARD OF ORAL SURGERY

Examinations for certification by the American Board of Oral Surgery will be held in Chicago, November 7 and 8, 1947.

A complete outline of the requirements for certification by the American Board of Oral Surgery, as well as general standards that have been set up for all specialists in dentistry by the Council on Dental Education of the American Dental Association, will be found in the April 15, 1947, issue of the Journal of the American Dental Association.

Requests for application forms or additional information should be addressed to Dr. Leslie M. FitzGerald, Secretary, 718 Roshek Building, Dubuque, Iowa.

UMI

POSTOPERATIVE INFECTION AND HEMORRHAGE AFTER EXTRACTION OF THIRD MOLAR

Frederick A. Henny, D.D.S.,
Detroit

A white man, aged 37, was first seen by me on September 10, 1945.

History.—A lower right third molar tooth had been extracted two weeks previously. Convalescence had been normal for about one week. Since that time pain began developing slowly in the right side of the jaw, associated with difficulty in swallowing food.

Examination.—Examination revealed some swelling in the right side of the neck beneath the angle of the mandible. Intra-orally considerable trismus was present, but it was possible to observe a definite swelling just medial to the ramus of the mandible. The temperature was 100.2 F. Our impression was that the patient had an early infection of the third molar socket. He was admitted immediately to the in-patient department of the hospital, and concentrated treatment was started consisting of throat irrigations with hot saline solution every two hours, penicillin 25,000 units intramuscularly every three hours, continuous hot moist stupes and forced fluids.

A routine physical examination showed early hypertension. Aside from blood pressure of 140/90, the physical examination was negative. A complete blood count showed: hemoglobin 15.2 gm.; red blood cells 4,690,000; white blood cells 17,200; polymorphonuclear leukocytes 79; small leukocytes 19 and monocytes 2. Fasting blood sugar was 126 mgm. of glucose per 100 cc. of blood.

Operation.—On September 11, the tooth socket was drained from an intra-oral approach under local anesthesia. A copious amount of foul pus was evacuated, and a small rubber drain was inserted. This treatment, however, did not influence the patient's course in any way, and his temperature continued to rise as high as 103 F. during that time. The extra-oral swelling continued to increase, and on September 14 it was obvious that more radical drainage was indicated. Because of the intra-oral drainage from the previous incision, we decided to drain the abscess extra-orally under procaine anesthesia, fearing a sudden release of a large amount of pus into the pharynx if a general anesthetic were used.

Second Operation.—The skin at the angle of the jaw was infiltrated with a 2 per cent solution of procaine with epinephrine. An incision was extended through the skin and subcutaneous structures about 1 inch below the angle of the mandible. Dissection was carried medially in a blunt fashion until the angle of the mandible was located. The angle was used as a landmark, and the infected space was entered by thrusting the dissecting scissors in a superior direction along the medial aspect of the ramus of the mandible. Considerable pus was evacuated. A thyroid drain was inserted.

Postoperative Treatment.—The patient returned to his room in excellent condition, but about two hours after the end of the anesthesia he began to bleed heavily from the extra-oral incision. We estimated that at least 500 cc. of blood was lost in a fairly short period of time. However, application of a pressure bandage controlled the hemorrhage satisfactorily, and it was unnecessary to pack the wound. The patient's temperature then took a downward course and receded to normal. He was discharged from the hospital on the seventh day after operation.

The culture obtained from the abscess was nonhemolytic streptococcus.—*Henry Ford Hospital.*

ACUTE MYELOGENOUS LEUKEMIA WITH PRIMARY ORAL MANIFESTATIONS

*S. P. Mallett, D.M.D.,**
*H. P. Golan, D.M.D.,***
L. C. England, D.M.D.,†
and J. H. Kutch, M.D.,††
Boston

Serious and even fatal diseases may, at their onset, show oral symptoms and manifestations for which the patient seeks dental services. This was true of the case to be reported. A girl, aged 12, consulted her dentist on September 22, 1946, for the treatment of oral lesions. She complained of bilateral pain of one week's duration in both the maxilla and the mandible. Because of her apparent distress she was admitted to the oral surgical department of the hospital and was transferred later to the pediatric service where a diagnosis of acute myelogenous leukemia was made. The course of the disease was rapid, and she died on the twenty-first day in the hospital.

Leukemia is a rare and fatal disease of unknown cause, characterized chiefly by the presence of large numbers of abnormal white blood cells in the blood stream, although aleukemic phases may occur in which the white blood cell count is below normal.

Acute myelogenous and lymphogenous leukemia usually occurs in children and nearly always, except for the monocytic form, in persons under twenty-five years of age. Usually it is rapidly fatal, death occurring within a few weeks. Often the attack is superimposed upon an acute infection, such as tonsillitis or a furuncle. There is malaise, headache, high fever, pain in the bones, extreme prostration and a rapidly increasing pallor. Ulcerative lesions appear in the mouth and throat, and marked enlargement of the regional lymph nodes of the neck occurs rapidly. The spleen and lymph nodes elsewhere in the body enlarge slightly. Bleeding occurs both externally and internally from the mucous membranes and occasionally in the fundus of the eye. Hemorrhages of the skin are almost the rule, and various types of vesicular eruptions are seen frequently. There is marked reduction of platelets and a rapid decrease in the number of red blood cells and the amount of hemoglobin. The number of white cells mounts at the same time, although it rarely attains the great height seen in the chronic form of the disease. Immature red cells are present in large numbers. Usually lymphocytes and lymphoblasts constitute more than 90 per cent of the white cells, but sometimes myeloblasts predominate.

In the myelogenous type of the disease, there is an increase in the number of white cells from 100,000 to 1,000,000 or more; the number of polymorphonuclear, eosinophilic and basophilic leukocytes increases relatively and absolutely; the number of lymphocytes is reduced relatively but increased absolutely, and immature cells

*Oral surgeon-in-chief, Boston City Hospital.
**Resident in oral surgery, Boston City Hospital.
†House officer in oral surgery, Boston City Hospital.
††House officer in pediatrics, Boston City Hospital.

Fig. 1.—Left: Appearance of patient on admission. Her face was swollen and she showed exophthalmos. There was evidence of chlorosis. Right: Hypertrophic tissue of the gums, which were edematous, soggy and reddish purple in color, covered the second molars

from the bone marrow are present. Blood platelets, usually abnormal in appearance, increase at first but decrease in number in the final stages of the disease. Usually neutrophilic myelocytes predominate in number, but instances of monocytic and eosinophilic predominance are seen. Cases of predominance of plasma cells have been described, and there are other types difficult to classify. Changes in the bone marrow have been observed to precede the positive leukemic manifestations in the peripheral blood, indicating that biopsy of bone marrow is advisable in all doubtful cases. Treatment is uniformly unsuccessful.

Report of Case

History.—The patient had had measles, mumps, pertussis, chickenpox and lobar pneumonia. A tonsillectomy was performed in 1941. The history was noncontributory to the present complaints. The patient's childhood was one of normal development, but she had always been nervous and easily frightened.

Physical Examination.—The patient was a sallow-complexioned, waxy-colored girl, 5 feet tall, weighing 100 pounds, in apparent pain and oral distress and perspiring freely. Her temperature was 100 F. by mouth, pulse was 120 and respiration 22 (Fig. 1, left). Her skin had a greenish tinge. There was a large swelling of the neck under the left side of the mandible, and a large firm left submaxillary lymph node. Her tongue was coated, her breath was fetid and her teeth were loose, with extrusion of the molars and bicuspids. The gingivae were hyperplastic, pale and necrotic at the margins (Fig. 1, right). Both eyes were exophthalmic, the left being more prominent. Results of examination of the ears were negative. There were large, firm, nontender, circumscribed masses in both breasts. The abdomen was distended and tense, and there was a hard, rock-like, immovable mass in the lower right quarter just anterior to the ilium. The mass could be felt on rectal examination. Results of examination of all other organs and extremities were negative.

Preliminary Diagnosis.—Acute leukemia.

Roentgenographic Examination.—Right lateral plates of the skull showed no evidence of metastases. There was slight prominence of the blood vessel markings. The heart was not enlarged, and there was no evidence of consolidation, fluids or metastases. A dorsal-longitudinal plate of the spine, pelvis and hips showed no metastases. Dental roentgenograms revealed resorption and extrusion of the posterior teeth (Fig. 2).

UMI

Fig. 2.—Dental roentgenograms taken September 24, 1946

Blood Chemistry Examination.—The patient's blood was type A. On September 30, culture of the blood disclosed no growth. On October 3, the carbon dioxide level was 49 per cent; nonprotein nitrogen was 38 per cent; total protein, 39 per cent; fasting blood sugar, 87, and chloride level, 76. On October 9, the alkaline phosphorus level was 1.76 units, and the calcium level was 10.8.

Urinalysis.—

Date	Color	Reaction	Albumin	Sugar	Acetone	Sediment
10/1	Yellow	Alkaline	Trace	None	None	Phosphates. No red blood cells.
10/3	Yellow	Alkaline	None	None	None	Rare red blood cells.
10/8	Yellow	Acid	None	None	None	Occasional casts; 1 or 2 red blood cells, 3 or 4 white blood cells.
10/10	Yellow	Alkaline	Trace	None	2	10 to 20 white blood cells; rare casts, 4 to 5 red blood cells.

Culture of the urine on October 3 showed Escherichia coli and enterococci.

Blood Chemistry Examination.—

Date	HGB	RBC	WBC	Platelets	Stained Specimen
9/30	75	5.00	6,450		43 polymorphonuclear leukocytes; 4 myelocytes; 15 young polymorphonuclear leukocytes; 3 young lymphocytes; 1 monocyte; 1 to 3 stippled cells; a few polychromatic cells; 1 normoblast, and 1 megaloblast (Fig. 3, left).
10/2	70	3.69	5,200	220,000	54 polymorphonuclear leukocytes; 9 myeloblasts; 4 premyelocytes; 10 myelocytes; 4 young polymorphonuclear leukocytes; 10 small lymphocytes; 4 young lymphocytes; 1 monocyte; 1 young monocyte; 2 eosinophils; 1 basophil; a few very basophilic cells; a few stippled cells; 5 megaloblasts, and 1 normoblast (Fig. 3, right).
10/3	60	2.75	8,200	130,000	57 polymorphonuclear leukocytes; 1 young polymorphonuclear leukocyte; 1 premyelocyte; 7 myelocytes; 1 myeloblast; 22 small lymphocytes; 4 young lymphocytes; 3 large lymphocytes; 1 monocyte; 3 young monocytes; 4 normoblasts, and 6 megaloblasts. Platelets were decreasing. Stippled cells were present.

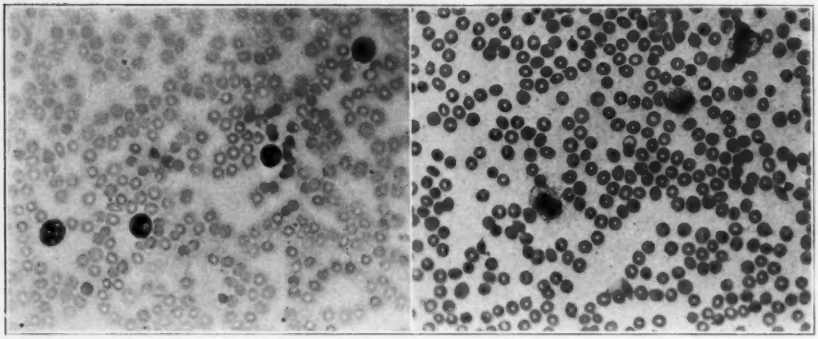

Fig. 3.—Left: Smear culture of blood (September 30, 1946) showing fairly normal neutrophils. Cell in upper right hand corner shows vacuolation. Red cells reveal moderate degree of anemia. Right: Blood smear (October 2, 1946) showing neutrophils to be large. Young forms with bilateral nuclei are broken and filled with toxic granules. Red cells still show moderate anemia

10/4	65	3.45	9,850	110,000	51 polymorphonuclear leukocytes; 11 young polymorphonuclear leukocytes; 5 premyelocytes; 5 myelocytes; 5 young monocytes; 1 monocyte; 19 small lymphocytes; 2 young lymphocytes; 1 broken eosinophil; 11 megaloblasts; 5 erythroblasts; 9 monoblasts; many free nuclei and basket cells; a few stippled cells; a few very basophilic cells, and one dividing cell.
10/5	60	3.05	11,400		59 polymorphonuclear leukocytes; 2 myeloblasts; 12 premyelocytes; 9 myelocytes; 2 basomyelocytes; 13 small lymphocytes; 3 young monocytes; many free nuclei and basket cells; 7 megaloblasts; 4 erythroblasts, and 2 normoblasts (Fig. 4, left).
10/7	66	2.92	24,400	180,000	50 polymorphonuclear leukocytes; 7 young polymorphonuclear leukocytes; 1 myeloblast; 12 myelocytes; 19 small lymphocytes; 1 monocyte, and 1 young monocyte. Platelets were not so reduced. A few polychromatic cells were present.
10/8	61	2.82	31,600	180,000	81 polymorphonuclear leukocytes; 1 premyelocyte; 7 myelocytes; 4 young monocytes; 1 monocyte; 7 small lymphocytes, and one dividing cell. Free nuclei and basket cells were increasing (Fig. 4, right).
10/10	55	2.46	50,000	70,000	49 polymorphonuclear leukocytes; 12 myeloblasts; 15 premyelocytes; 15 myelocytes; 6 small lymphocytes, and 3 young monocytes. Free nuclei in basket cells were increasing in number. Platelets were decreasing.
10/11	55	2.49	52,000	50,000	10 polymorphonuclear leukocytes; 85 myeloblasts; 2 myelocytes; 3 eosinomyelocytes; marked variations; many free nuclei and platelets, and six dividing cells.

Biopsy.—Bone marrow taken by sternal puncture on October 1 disclosed: polymorphonuclear neutrophils, 5 per cent; polymorphonuclear neutrophils (band form), 40 per cent; polymor-

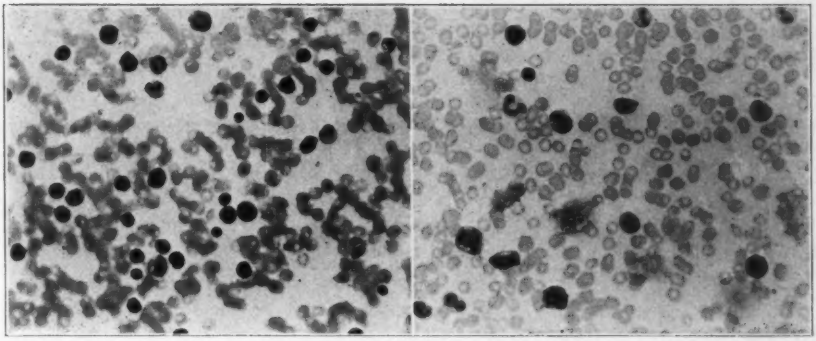

Fig. 4.—Left: Smear culture of blood (October 5, 1946) showing marked increase in number of neutrophils with many young forms including basket cells, normoblasts, erythroblasts, myelocytes and premyelocytes. Red cells, pale serrated and with little hemoglobin, now show anemia. Right: Blood smear (October 8, 1946) showing marked increase in number of myelogenous cells. One cell at center left of picture shows mitosis. Free nuclei, basket cells, premyelocytes, myelocytes and myeloblasts are increasing in numbers

phonuclear basophils, 1 per cent; small lymphocytes, 11 per cent; large lymphocytes, 1 per cent; adult monocytes, 18 per cent; metamyelocytes, 2 per cent; myelocytes, 18 per cent, and myeloblasts, 4 per cent. Platelets were decreased, red blood cells were hypochromatic and stippled cells and nucleated red cells were present.

Progress Notes.—October 3. Since the patient did not respond to it, penicillin was discontinued and sulfadiazine was instituted. Her general condition remained the same. The original blood count was normal, but the report on October 2 revealed anemia and the presence of young cells of myelogenous series. A transfusion of 250 cc. of whole blood was given. There was no reaction. The blood count before transfusion showed progressive anemia which had begun on the preceding day. The white cell count was still within normal limits. The number of platelets dropped, and there were more young cells in the smears. Blood chemistry was within normal limits. Roentgenograms of bones, chest and jaws were negative for evidence of metastases. The patient complained of severe oral pain.

October 5. There was no change in the patient's general condition. Little change was noted in the blood count after transfusion. The white cell count was increasing.

October 6. Five hundred cubic centimeters of whole blood was given. The patient complained of pain in the ears, especially the left, and experienced some difficulty in opening her mouth. Her general condition was worse.

October 9. The patient was failing quite rapidly. The last blood count showed marked anemia, and the white cell count had risen to 30,000. Sternal puncture was performed. Six hundred cubic centimeters of whole citrated blood was given without reaction on the part of the patient.

October 10. The response to transfusion was poor, and anemia was more marked than before the transfusion. The platelet count had decreased to 70,000 and the white cell count had risen to 50,000. Examination of material taken at sternal puncture revealed definite acute myelogenous leukemia. Oral swelling and exophthalmus were more pronounced. Ecchymoses were present over the abdomen. The patient was unable to close her mouth and had difficulty in moving her jaws because of increased oral hypertrophy and swelling. Her condition was worse.

October 13. At 10:35 p. m. the patient was pronounced dead.

Throughout the course of the disease, the temperature fluctuated between 100 and 102 F., which is characteristic of the disease. The patient was given a mild sedative of aspirin grains 10, as required, but as the severity of the oral pain increased, codeine grains 1/8 every six hours was given. Later, morphine sulfate grains 1/8 was given every six hours as required and afterward the same dose was given every six hours by the clock. During the later stages of the

disease the patient became semicomatose and lethargic in contrast to her reaction in early stages, during which she screamed with pain on irritation of the oral mucosa. The patient received oral rinses of bland warm saline solution and 50 per cent hydrogen peroxide.

Penicillin 20,000 units every three hours was given from September 23 to October 11. The patient received five transfusions of whole blood: 250 cc. on October 3, 500 cc. on October 6 and 600 cc. on October 9. The blood pressure fluctuated from 120/60 to 150/50 just before death.

Discussion.—This case report serves to illustrate the rapid and fatal termination of acute myelogenous leukemia. It further illustrates how dentists are called upon to recognize systemic diseases by oral lesions. Such cases should be recognized early and the patient directed to the proper source for all possible treatment. It is important in cases of this sort to refrain from surgical intervention such as extraction of teeth. Intervention will create wounds which will not heal and which will hasten the progress of the disease.

Summary.—An acutely ill girl, aged 12, was admitted to the hospital with a temperature of 100 F. on September 23, 1946. Arrival at a diagnosis was hindered at first by the normal blood picture. Chemotherapy was instituted prophylactically. Diagnosis of acute myelogenous leukemia was made from blood smears and examination of bone marrow taken by sternal puncture. The patient died after a rapid downward course of 21 days' duration.

Conclusions.—Because symptoms of acute myelogenous leukemia may be observed first in the oral cavity, it becomes the duty of dentists to be alert to the signs and symptoms of this disease. No oral surgical procedures should be performed before adequate consultation with serologists. After diagnosis is established, the dentist's functions should be restricted largely to maintaining oral hygiene and to minimizing the patient's discomfort.—*Boston City Hospital.*

AMERICAN SOCIETY FOR ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

The fall meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held on Monday evening, October 27, at the Hotel New Yorker, New York. The program will consist of sound movies on intravenous and nitrous oxide-ether anesthesia; an address, "Analgesia: Its Practical Aspects," by Morris Fierstein of Jamaica, N. Y., and an essay and movie, "The Pharyngeal Gasway," by Lawrence Sherwin of Cortland, N. Y.

An informal dinner will be served at the hotel at 6:45 p. m. before the meeting. The scientific session will begin at 8:15 p. m. The profession is welcome.—*M. Hillel Feldman, Executive Secretary, 730 Fifth Avenue, New York.*

PACKING THE LATERAL INCISIONS IN CLEFT PALATE REPAIR

Harold I. Harris, M.D.,
Hollywood, Calif.

An investigation of the problem of packing the lateral incisions associated with cleft palate repair was begun about a year ago. Until that time, it was our custom to pack these incisions with iodoform gauze. In some instances, the gauze pack was sutured in place. It was left in position from three to five days. The tissues became soggy, soft and saturated with blood and oral secretions. Two or three days later, sogginess had increased, and there was an associated characteristic odor. Secondary contamination from the oral cavity, caused by the decomposed blood and the food, changed the packed region to a bacterial reservoir. The margins were a greyish color and showed evidence of low grade inflammation. When the packs were removed there was a variable amount of bleeding in a large number of cases.

I was of the opinion that the packs were being left in place too long. Thereafter, I removed the packs after the third day. The odor and secondary contamination were not as marked, but the bleeding on removal was still present in the majority of cases. It was then decided to omit the packing in cases in which it appeared that the amount of bleeding was not excessive or the degree of relaxation on the suture line produced by the packing was not necessary. It was found that these palates were cleaner, and that the lateral margin of the mucoperiosteal flap and the margin along the alveolar side approximated each other in twenty-four to thirty-six hours. The area appeared clean. Some slight strain on the suture line, however, appeared as an indentation upon the tissues by the sutures, even though the same amount of tension was used in tying all sutures.

Purpose of Packing

It had been my impression that the primary purpose for packing in the incisional area was fourfold: (1) to relieve tension on the suture line; (2) to prevent contamination by food; (3) to stimulate granulation, and (4) to stop bleeding. Wire tension sutures or Vaughan's ribbons will relieve tension on the suture lines, and the wound will not be contaminated by food if the patient is given a high caloric fluid diet during the first three days. Use of the pack to stimulate granulation tissue and to stop bleeding must be considered, however. Therefore, I have continued the use of the pack for the first twenty-four to forty-eight hours.

On my last yearly clinical tour I observed at various clinics the technics and procedures employed by men representing a cross section of the leaders in oral surgery. I made special note of the problem of the use of packing in lateral incisions.

The majority of the men used iodoform gauze packing, some with sulfanilamide crystals, some with sulfathiazole powder. Though some used plain gauze packing, others supplemented it with sulfanilamide crystals or powder or one of the various sulfathiazole ointments. Some sutured the gauze in position routinely. At only one prominent clinic no packs were used. I did not question the surgeons as to why they did or did not use the packing.

After seeing demonstrations of the use of oxidized cellulose at two medical meetings, it occurred to me that it might be used as a pack in the lateral incisions made during palate repair. I asked the demonstrators if it had been so used. To their knowledge it had not.

I consulted with Emil Tholen, chief of the oral surgery service at the Children's Hospital, Los Angeles, regarding the value of the use of the material as a packing. A program was set up to determine, if possible, whether such packing would stimulate granulation tissue, give relaxation, prevent the accumulation of food and associated odor and stop bleeding.

Variation in Treatment

Some patients were treated with iodoform gauze packed on one side and an oxidized cellulose pack on the other; some with oxidized cellulose on one side and no pack on the other, and several with oxidized cellulose on both sides.

Usually the cellulose was inserted dry but occasionally it was moistened before packing. Where the procedure indicated, the oxidized cellulose was sutured in place. The oxidized cellulose turned into a dark brown mass and at the same time produced hemostasis. To expel some of the excess blood it was occasionally necessary to apply pressure with a sponge if the oozing was more brisk than normal. The oxidized cellulose acted as a plug and remained in place. On the second day it shrank and, by the third day, usually was expelled. If it was not expelled, a dark brown narrow area was noted which was clean and without the usual greyish areas associated with other types of packing. In cases in which the iodoform gauze pack was used on one side and the oxidized cellulose on the other, the usual foul odor and apparently contaminated area were present as well as a slight amount of bleeding when the iodoform gauze was removed on the third day. The other side was clean.

On the basis of this experiment, I concluded that if a pack is indicated the oxidized cellulose has five advantages: (1) it does not need to be removed; (2) it eliminates secondary bleeding which usually occurs after the removal of other packs; (3) it gives the same amount of immediate relaxation on the suture line as that afforded by other packs; (4) it is not conducive to the secondary infection often associated with other types of packs that absorb the oral secretions, and (5) it acts as a hemostatic agent.—*6253 Hollywood Boulevard.*

EXTENSIVE DENTIGEROUS CYST OF THE MAXILLA WITH INTRACYSTIC AMELOBLASTIC PAPILLOMA

G. Victor Boyko, D.D.S., M.S.,
and A. M. Mohnac, D.D.S.,*
Paterson, N. J.

The present concept of medicine and dentistry rapidly is becoming one of prophylaxis in the treatment of various medical and dental diseases. In no field can this concept of prophylaxis be applied more aptly and with more beneficial results than in the early detection and treatment of the various types of cysts of odontogenic origin. Of these—the radiculodental, follicular and adamantinomatous—the follicular, of which the dentigerous is one phase, seems to require a most careful preoperative and postoperative study for differentiation and best operative results.

Cystic growths of odontogenic origin involving the jaws may enlarge to form extensive tumor masses and encroach on anatomic tissue structures, such as the maxillary sinus, nasal chamber and orbital cavity, without evidence of either subjective or objective symptoms. This absence of early pain or noticeable swelling contributes to extensive destruction of tissue and frequently irreparable deformity. It is not unusual for the antrum to be obliterated by resorption of bone involving the turbinate and ethmoid regions before the patient is sufficiently uncomfortable to seek the aid of a physician or dentist. In the mandible, the body and ramus are subject to cystic involvement with frequent bone resorption resulting in attachment of adjacent soft tissue. The mandibular vessels and nerve within the mandibular canal often may be implicated by extensive cystic tumors.

The term dentigerous cyst implies tooth-bearing. Cysts of the dentigerous group, which form after the enamel organ has produced the crown of the tooth, always have a tooth remnant within the sac lined bone cavity. Therefore, the dentigerous cyst is the tooth-bearing type of the general classification of follicular cysts and should be distinguished from the follicular cysts which contain no tooth remnant. The term dentigerous should not be used ambiguously to include every type of cyst of the jaw of odontogenic origin.

The cause of the dentigerous cyst has been discussed under several theories. It seems reasonable that this type of cyst results from some form of irritation, mechanical or otherwise, of the dental follicle. Trauma, chemical irritation and infection induced at the appropriate period during development of the tooth may result in the production of a fluid between the sac and the crown of the tooth. This fluid is considered an exudate from the cells of the external epithelium of the enamel organ. Consequently, the dentigerous cyst begins growth during the formation of the tooth follicle and progresses slowly and painlessly. Growth of the cystic tumor is believed to be governed by the quantity and tension of the fluid exudate within the follicle. The enlarged cystic cavities of the dentigerous type of cyst are lined with a membrane, the inner portion

From the Oral Surgical Service, Paterson General Hospital.
*Captain (DC) AUS.

of which consists of squamous epithelium. These cysts, unless secondarily infected, may contain a clear straw colored fluid in addition to the tooth remnant. The walls of the more extensive dentigerous cysts may be thinned and forced beyond the normal contour of the jaw. The symptom of fulness frequently leads to discovery of the lesion.

The dentigerous cyst may involve any tooth in either jaw, but usually is located in the cuspid and third molar regions. Follicles of supernumerary teeth also may be the site of these lesions. An early symptom leading to discovery of this growth may be the absence of a tooth from the dental arch. The roentgenogram and, in doubtful instances, microscopic study of a tissue specimen, verify the diagnosis.

It has been reported that a dentigerous cyst may contain ameloblastic tissue cells or enamel epithelium as cell remnants within its tissue wall. Cahn[1] reported in 1933 that an odontogenic cyst is a potential adamantinoma. This is logical, since the adamantinoma has been known to arise from a type of epithelium assumed during certain stages of development of the dentigerous cyst. The term adamantoblastoma, which is used synonymously with ameloblastoma, may have the advantage over the latter term in classifying this form of tumor on a histopathologic basis.[2]

The established fact that the dentigerous cyst may give rise to a more serious ameloblastoma emphasizes the necessity of a microscopic study of all cystic tissue. When the clinical diagnosis is doubtful, preoperative biopsy may be required as an aid in deciding on the type of operative procedure. It is good surgical judgment to enucleate the entire cystic membrane if the microscopic tissue examination reveals the presence of residual ameloblastic tissue. Furthermore, if the histopathologic specimen reveals portions of ameloblastic growth, a careful postoperative check should be made over a period of several years.

In treating these large dentigerous cysts of the maxilla, complete enucleation of the membrane is the procedure of choice in most instances. Under certain circumstances, partial excision may be necessary so as to conserve certain anatomic structures. In these cases, suturing the cystic membrane to the oral mucous membrane to form one continuous cavity will help to retain teeth and vital bone structure. The type of operation depends on many conditions such as the size of the cyst, its location and the tissue involvement. Good surgical judgment will be required for best results.

The case cited is reported in order to evaluate and stress the value and necessity of four factors: (1) large 5 inch by 7 inch or 8 inch by 10 inch extra-oral roentgenologic views for diagnostic examinations for idiopathic vague reflex nerve disturbances about the face and head, particularly if the usual intra-oral dental films have proved negative; for only by extra-oral views can one obviate pathologic conditions and growths beyond the scope of the intra-oral dental film; (2) careful histopathologic study of all cystic tumor tissues removed from the jaws; (3) enucleation of the entire cystic membrane when remnants of ameloblastic tissue cells are evident in the microscopic examination of the cystic tissue, and (4) routine, periodic, postoperative roentgen study of all patients who have had large cystic masses removed, in order to obviate recurrences of cystic epithelial cellular elements.

Report of Case

History.—A white girl, aged 17, was referred to us on July 31, 1945, for examination of a swelling of the upper right side of the jaw. The patient stated that a year before she had an upper right third molar extracted. Healing was uneventful, but several weeks later she observed

1. Cahn, L. R., Dentigerous Cyst as Potential Adamantinoma. *D. Cosmos* 75:889 (September) 1933.
2. Thoma, K. H., *Oral Pathology*. St. Louis: C. V. Mosby Company, 1941.

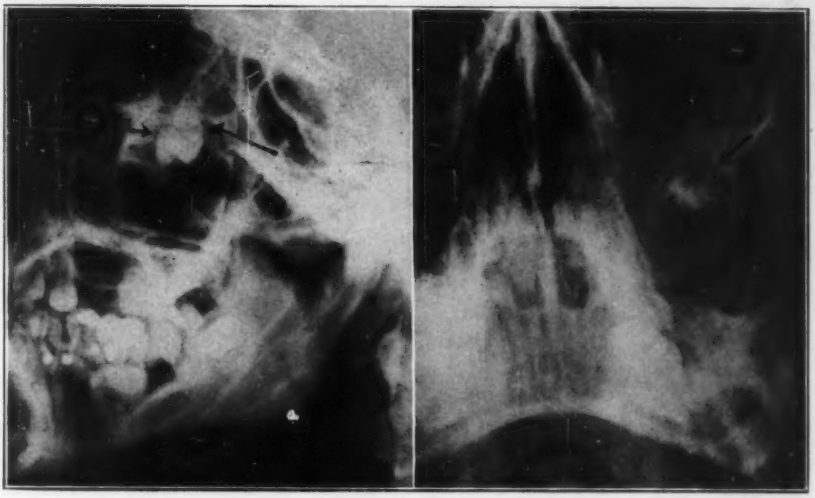

Fig. 1.—Left: Lateral roentgen view showing position of tooth enclosed within cystic area. Right: Postero-anterior view demonstrating erosion of orbital ridge and antrum by cystic lesion

a feeling of pressure and fulness in the upper right side of the jaw. Over a period of time she also noticed a slow swelling at the site of the fulness which was hard to the touch. Becoming alarmed, she consulted her physician, who, in turn, referred her to a dentist. Intra-oral roentgenograms taken at this time were reported negative as related to the cause of the swelling. During the period of consultations, this swelling, although without any sharp pain, continued to cause an uncomfortable sensation of pressure and fulness throughout the right side of the patient's face.

Since the age of 9 or 10 years, the patient had been troubled with myopic vision for which she wore glasses. She had measles and chickenpox as a child. At the age of 7 years she had a tonsillectomy, and at the age of 12 a right mastoidectomy. The patient had recurrent headaches which were provoked by a car ride or excess emotional strain. For the past six months she had noted occasional "stuffiness" of the nose and head during repeated evenings. The respiratory, cardiac and gastro-intestinal history was negative.

Examination.—The patient was a well developed girl, cooperative and in no acute distress. A well healed mastoidectomy scar was noted immediately behind the right ear. Ophthalmoscopic examination revealed no abnormality. The face was noticeably asymmetric. The right side revealed a pronounced fulness of a diffuse character, involving the area over the right antrum and extending toward the parotid region. Palpation elicited a slight discomfort but no sharp pain. The heart and lungs showed no remarkable symptoms, and neurologic signs were negative.

Intra-orally, a soft diffuse mass 3 cm. long and 2 cm. in width involved the right side of the maxilla. This swelling extended distally from the cuspid region to the third molar area and from the midline of the palate buccally toward the malar process. The surface membrane appeared hyperemic. Palpation of this mass elicited no acute tenderness. No fistulas or fluid discharges were evident. There were no tonsils, and the pharynx was clean. A few small nontender cervical nodes were palpable on the right side. There was no associated edema.

Laboratory Examination.—The preoperative blood count showed: hemoglobin 88 per cent; erythrocytes 4,460,000 per cubic millimeter; leukocytes 5,600 per cubic millimeter; polymorphonuclear neturophils 60 per cent, and lymphocytes 40 per cent. Response to the Kline test was negative. Urine examination and blood chemistry revealed no abnormal findings.

Roentgenographic Examination.—The roentgenologist reported that the flat film demonstrated a homogeneous semi-opacity of the right side of the maxilla which measured about 3 cm.

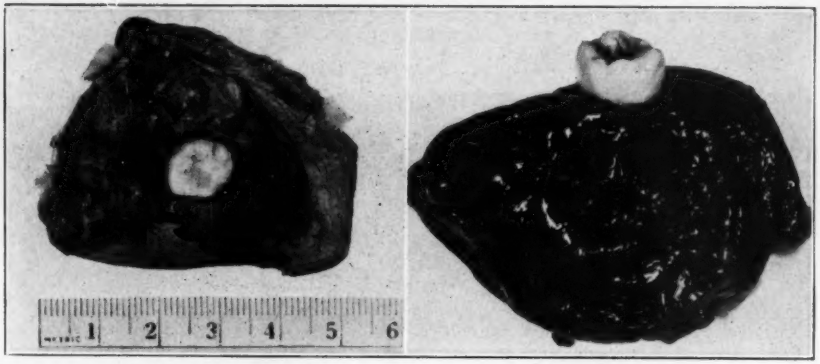

Fig. 2.—Left: Gross specimen of cystic tumor with tooth enclosed. Right: Gross specimen of cystic lesion showing marginal attachment to enclosed tooth

by 3 cm. There was an essentially normal appearing molar tooth within the roof of the cyst involving the antrum (Fig. 1).

The postero-anterior and lateral stereoscopic views demonstrated an extensive amount of erosion of the antrum, particularly the roof, the inferior orbital ridge, the floor of the orbit and to a lesser degree the lateral wall of the antrum. The molar was within a large dentigerous cyst involving the antrum.

Operation.—On October 4, 1945, preoperative narcosis of the patient was achieved with morphine sulfate grain 1/6 and scopolamine grain 1/150. Anesthesia was induced with cyclopropane and maintained by endotracheal administration of ether. An initial vertical flap incision was made labially and palatally over the lateral incisor region, extending distally along the gingival margin to the third molar region. The soft tissue flap was elevated buccally to expose the maxilla up to the malar process. Exposure on the palatal margin was not so extensive. The underlying buccal wall of the maxilla was partly resorbed, and the cystic membrane was seen to be attached to the adjacent mucoperiosteum. Some of the maxillary bone was excised to expose the greater portion of the cyst. During the blunt dissection for enucleation of the cystic membrane from the adjacent soft and hard tissues the sac was unavoidably ruptured, and a coffee colored discharge escaped. The cystic mass extended upward to the orbital rim, distally to the pterygoid plexus and externally to involve the maxillary wall up to the malar bone with an obliteration of the greater part of the antrum. The turbinates were exposed but not perforated. Some resorption of the palatal bone was evident (Fig. 2). These figures show the gross specimen of the enucleated cystic mass with the enclosed portion of the tooth found attached to the upper wall of the tumor. After removal of the cystic membrane, the soft tissues were approximated with dermal sutures, and iodoform gauze was inserted for drainage through an accessory incision made in the buccal region just below the malar process. The primary incision was sutured in position.

Biopsy Report.—The specimen consisted of a mass of fairly firm mucinous pink tissue about 1 cm. in diameter. A tooth and also a piece of bone about 5 mm. in diameter were in a separate bottle. There was a thin shell of bone measuring 2 cm. by 1 cm. and a cyst, previously sectioned, whose contents were lost. When reconstructed it measured 4½ cm. in diameter. The lining was smooth and pink to red in color. Attached to one side of the wall and protruding into the cavity was a well defined tooth measuring 1 cm. in diameter. The cyst wall varied in thickness from 1 mm. to 2 mm. The external surface of the cyst was rough, and thin sheets of bone adhered to it.

A dense, irregularly laminated layer of muscle and fibrous tissue formed the outer wall of the cystic neoplasm. The wall was poorly vascularized, but an increase in the size and congestion of the blood vessels was seen where the loose, somewhat edematous layer of fibroblasts formed

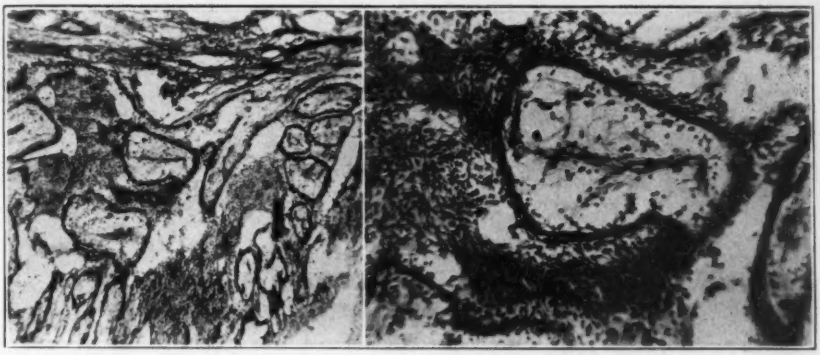

Fig. 3.—Left: Low power microscopic view of histopathologic section showing cystic arrangements of epithelial elements. Right: High power view of section shown at left

the immediate stroma for the neoplastic epithelial elements. The stroma was infiltrated moderately by lymphocytes and polymorphonuclear neutrophils. The epithelial elements were irregular sheets condensed somewhat where they merged with the underlying stroma. These elements formed coarse papillary projections and ill defined cysts. The individual cells were small, stellate with long processes, and had compact small ellipsoidal or elongated, evenly stained nuclei that showed no tendency toward hyperchromatism or mitosis. The cells resembled those of the enamel organ, and although the growth was not typical, it was believed to be an adamantinoma (Fig. 3).

Treatment and Progress.—The patient recovered from the operative procedure uneventfully except for the disturbance in vision which became apparent on the third postoperative day. Ophthalmologic consultation revealed a pronounced functional myopia for which bifocals were prescribed to relax the accommodation and convergence. The pronounced muscle imbalance was believed to have been precipitated as a reaction to the operative procedure.

The immediate postoperative care consisted of hot saline irrigations, and the iodoform gauze was changed every 48 hours. The patient was discharged from the hospital on the fifth day after operation.

Further postoperative treatment consisted of changing the iodoform gauze every third day and irrigations with hot saline solution until the fourth week, when the gauze was eliminated. The patient returned to school four weeks after her operation. A restoration was constructed by her dentist two months after her discharge from the hospital.

On March 7, 1946, the ocular muscle imbalance was considerably improved. The bifocal additions and prisms were removed from the glasses on this date for a short period.

By February 3, 1947, the ophthalmologist reported that the near correction segments and prisms were removed from the glasses permanently. The ocular muscle balance had returned to normal. The patient was using single vision glasses regularly with excellent results.

Oral examination on April 27, 1946, revealed a firm healing of tissue with only a moderate depression over the buccal area. The tissue appeared to have good tone. No fistulas were evident.

A roentgen examination, made seven months after the operation, revealed an asymmetry of the maxillary sinuses, the right antrum appearing smaller than the left in its vertical and horizontal diameters. The floor and outer wall of the right maxillary sinus also appeared thickened with some condensation of bone in this region. Otherwise, no pathologic condition was evident (Fig. 4). The initial complaint of headaches had been eliminated. Intra-orally, the tissues were completely healed, and a restoration was in position.

Comment and Summary

It is hoped that the detailed report of this case has brought out several important

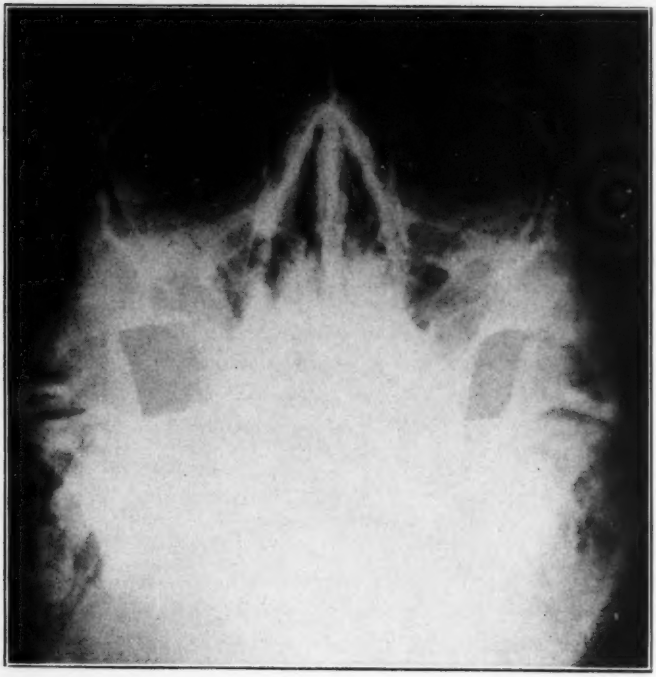

Fig. 4.—Postero-anterior roentgenogram made seven months after operation showing tissue regeneration within operative area

factors relevant to a more thorough diagnostic study and treatment of oral cystic growths.

In those cases in which the objective and subjective clinical manifestations indicate the necessity for a more detailed examination, particularly if the intra-oral dental films have proved negative, extra-oral lateral and postero-anterior roentgenograms must be made. Furthermore, it is good judgment to include the extra-oral roentgenograms in the routine roentgenologic studies of the teeth and jaws for early detection of deep seated lesions.

The value of a detailed biopsy for the purpose of determining the precise histopathologic type of cystic tissue cannot be too highly stressed. As has been shown, cystic masses which clinically and roentgenographically are obviously dentigerous or follicular may show definite adamantoblastic elements when examined carefully under the microscope. Obviously, a thorough enucleation of the cystic membrane must be performed to prevent a recurrence.

However, even though a thorough enucleation has been made, the possibility that adamantoblastic elements may have been left behind would certainly dictate periodic, postoperative roentgenographic examinations in order to detect any new growths in their incipiency.—*64 Hamilton Street.*

EFFECT OF ROENTGENOTHERAPY ON OSTEOFIBROMA OF THE MAXILLA

Arthur M. Maris, D.D.S.,
Iowa City, Iowa

The benign osteogenic tumor which formerly was designated as localized osteitis fibrosa and later described by other terms, the most popular being fibro-osteoma (Thoma)[1] or ossifying fibroma, is a relatively rare entity.

The cause of these tumors is not well understood. In reviewing 14 cases in 1935, Furedi[2] found that only 4 of 7 cases of the hyperostotic (condensing) type and 1 of 2 cases of fairly normal type of bone structure showed evidence of bacterial foci, whereas the three hypostatic (rarefying) lesions showed no evidence of bacterial foci. She stated, however, that ". . . we certainly know well that the negative bacterial report does not eliminate a bacterial etiology, especially in tissue pathology."

Furedi further states:

> Our material is not large enough to permit conclusions, but we believe that in spite of the variety and difference in radiological and microscopical and probably bacteriological findings, and in accordance with the similarity of the clinical features, these hyperostotic and hypostatic growths belong to the same group—namely, to the group of localized osteitis, one sclerosing, the other rarefying. We do not feel competent to state the probability of the different etiological factors, but we feel that with some warrant we can assume that the hyperostotic type is a reactive proliferation of the bone and bone marrow due to bacterial infection caused by these minute bacterial foci.

Direct trauma was not evident in any of the cases reported by Furedi.

The patients with localized osteitis fibrosa who have come under our observation have given no definite evidence or history of infection or trauma. Some do give histories of vague pains, and some have lost teeth from the regions affected. One might deduct, from this information, that dental disease might be etiologic.

Although there are evidences that osteitis fibrosa is a reactive bone lesion, this entity has many of the characteristics of a true neoplasm. We usually regard and treat it as such.

Tentative diagnosis of this condition is based on deformity and roentgen findings. It must be differentiated from normal bone exostoses, central giant-cell tumor, sarcoma and adamantinoblastoma and the localized bone lesions found in hyperparathyroidism. Final diagnosis should always be proved by biopsy.

On the assumption that the condition is a reactive bone lesion, it can be rationalized that no treatment is necessary in some cases. Lesions in which there is evidence of growth, with or without pain, should be treated if possible. We have operated on all patients from whom the growth could be removed totally without extensive loss of teeth and bone. Some lesions, notably those occurring in the proximity of the lower incisor teeth, can be followed by periodic roentgen examination. They usually remain asymptomatic.

Roentgenotherapy can be used in cases where surgery would be too deforming. For

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From the Oral Surgery Division, Department of Otolaryngology and Oral Surgery, State University of Iowa Hospitals.

1. Thoma, Kurt, *Oral Pathology*. St. Louis: C. V. Mosby Company. Second edition.
2. Furedi, A., Study of So-Called Osteofibroma of the Maxilla. *D. Cosmos* 77:999 (October) 1935.

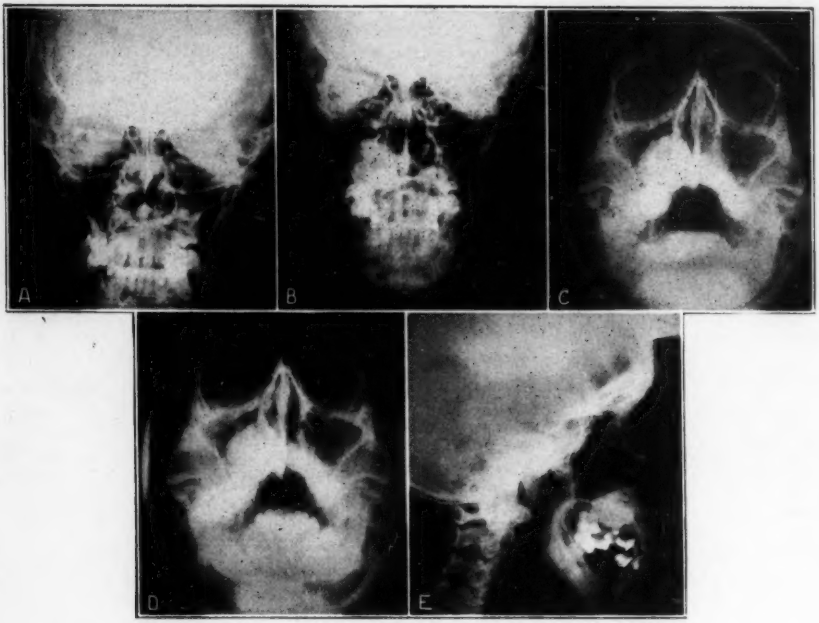

Fig. 1.—A: Roentgenogram taken November 4, 1932, showing skull and sinuses to be negative. B (December 18, 1940), C (March 24, 1943), D and E (March 28, 1946) show progressive calcification of the tumor. Note how the tumor occupies much of the normal antral space. The antrum, which has decreased in size accordingly, appears to be normal

the past nine years we have had the opportunity to observe a patient treated in this manner. Roentgenotherapy was chosen in this case because surgical removal would have resulted in involvement of a healthy antrum, plus the loss of much alveolar process, a large section of the hard palate and all the teeth posterior to the upper left cuspid.

Report of Case

History.—A woman, aged 31, entered the clinic on December 12, 1937, complaining of deformity and a dull pain in the upper left side of the jaw. Her hospital record showed that she had been examined in our department five years before because of pain in her head. At that time the teeth and alveolar processes were declared negative. Unfortunately, the dental roentgenograms taken then have been lost, but plates of the skull (Fig. 1A) were negative. Her condition was diagnosed as migraine and she was given phenobarbitol sodium and Pyramidon.

Examination.—A moderate enlargement was found on the buccal side of the alveolar process from the upper left cuspid to the upper left second molar. There was a slightly greater enlargement in the palate, extending about half the distance from the gingival margin of the teeth to the median raphe. The bicuspid teeth had been extracted in 1926, because it was thought that they were the cause of pain in the left side of the patient's face and head.

Roentgenograms taken December 12, 1937 (Fig. 2A) showed a peculiar architecture in the alveolar bone, extending well into the palate and facial wall of the maxillary sinus. There was a distinct bulge antrally, with a thin bony wall outlining and separating it from the normal

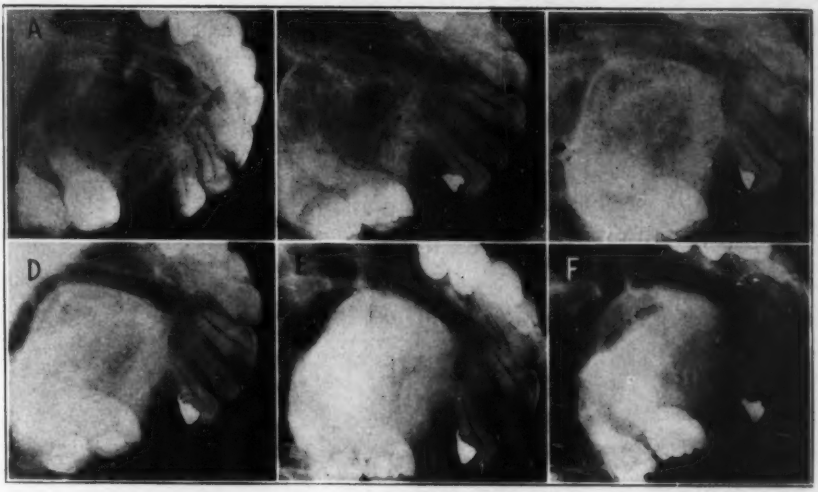

Fig. 2.—Intra-oral roentgenograms showing calcification of the tumor. A (December 12, 1937), B (October 16, 1939), C (December 18, 1940), D (January 17, 1942), E (March 25, 1943) and F (March 28, 1946)

maxillary sinus. The tumor had expanded into the floor of the sinus much more than into the alveolar process.

A biopsy was performed on January 6, 1938. The deep section of what appeared to be porous bone was removed from the buccal side at the crest of the bulge, well above the teeth.

Pathologic Report.—The mass was composed of fibrous tissue and bone. There were proliferating fibroblasts and adult fibrous cells. There was considerable hemorrhage and a few phagocytes containing brownish yellow pigment granules. The fibrous tissue was for the most part rather adult. No normal marrow was found. There were numerous bone trabeculae with active new bone formation as a conspicuous feature. No areas of giant-cell tumor structure were found. The few giant cells present appeared to be osteoclasts and were associated with the bony spicules. The cell formation was compatible with a diagnosis of osteitis fibrosa. Whether the mass was a localized lesion or part of a generalized disease could not be determined from its structure.

Blood chemistry examination showed serum calcium to be 9.4 mg. per 100 cc. and serum phosphorous 4.1, which is within normal limits. Roentgenograms of other bones were negative. These findings eliminated the possibility of hyperparathyroid disease. Therefore, diagnosis of localized osteitis fibrosa was made.

Treatment.—Because the patient complained of dull pain in the upper left side of the maxilla and felt this region to be enlarging, we referred her to the Department of Roentgenology for treatment.

A total of 900 roentgens was directed to the tumor on March 7 and 9, 1938. The patient returned for periodic examinations. On October 16, 1939, almost twenty months after treatment, the tumor seemed slightly larger. Roentgenograms showed a slight increase in density, however (Fig. 2B). The patient was referred again to the Department of Roentgenology. Although the blood chemistry findings were within normal range and there was no clinical evidence of hyperparathyroidism, it was felt that irradiation of the parathyroids might be of some value. A total of 1,200 roentgens, 600 to each side, was administered to the parathyroids. The patient was also placed on a diet high in calcium and vitamin D.

Progress.—Fourteen months later, examination revealed no change in size or contour but a definite increase in density (Figs. 1B and 2C). The greatest density seemed to be reached on

March 25, 1943 (Figs. 1C and 2E), at which time the patient was examined. At the last examination, three years later, March 28, 1946 (Figs. 1D, E and 2F), the lesion had not changed clinically; however, roentgenograms showed a slight decrease in density. This may have been caused by a difference in exposure or development of the film.

Conclusions.—The lesion has improved in that we now have a well-defined, uniformly dense mass of osseous tissue in which growth has been arrested. Symptoms of pain have disappeared. Therefore, we believe that roentgen rays in proper doses are indicated for treatment of certain lesions of this type.—*Oral Surgery Division.*

BLOOD PLASMA

Of greatest importance is the knowledge gained with the use of plasma and whole blood in wound shock. Early experience demonstrated that those who were resuscitated from shock by the administration of plasma presented a severe secondary anemia in convalescence. Further, those in extreme shock could be resuscitated only with the administration of whole blood. Later laboratory investigations of blood volumes and hematocrit readings demonstrated definitely that lowered blood volume was the important factor in wound shock, and that the lowered blood volume was due to loss of whole blood rather than plasma, with certain few exceptions. Plasma therefore is not the ideal agent in most cases of wound shock, and when so used is frequently a poor substitute for whole blood. When used to restore blood volume it dilutes the remaining red cells. If blood loss has been large, the resulting diluted blood may be so deficient in red cells as to be ineffective as an oxygen carrier in the seriously wounded individual who must have surgical care.

The necessity for whole blood in restoring blood volume was most apparent in those casualties with severe or multiple wounds. If large quantities of plasma were used in resuscitating such individuals they did not tolerate prolonged anesthesia and surgery necessary to the care of their wounds. When whole blood was used in adequate quantities, surgical procedures were well tolerated and frequently extended over a period of many hours. The amount of blood required before and during surgery frequently totalled 3,500 to 5,000 cc. and occasionally more was required. In those with minor degrees of shock accompanying wounds which were not extensive and severe, resuscitation and surgical care were occasionally accomplished with, or following, plasma therapy and no blood. However, the margin of safety is certainly greater if every individual in shock from war wounds or similar injuries receives some whole blood before or during surgery.

Plasma has a definite and important place in peacetime surgery. It should be available everywhere for emergency management of the shock of severe burns. It should likewise be available for the management of traumatic shock to sustain life until whole blood is available. Its limitations in the management of shock should be well known so that it is not given in large quantities when whole blood is needed. A program to provide properly prepared and packaged plasma at low cost for emergency use throughout the nation would appear to be desirable.—Howard E. Snyder, in *Surg., Gynec. & Obst.* **84**:1125 (June) 1947.

UMI

METASTATIC CARCINOMA OF MANDIBLE: REPORT OF CASE

James R. Cameron, D.D.S.,
and J. J. Stetzer, Jr., D.D.S.,
Philadelphia

A white man, aged 64, was referred to us in November 1935, complaining of pain in the left side of the maxilla. The pain had localized in the third molar region.

History.—In 1929, the patient suffered with chronic osteo-arthritis of the right hip. Since then his hip had been quite stiff and he had been almost totally unable to abduct his leg. In June 1934, he was under the care of a urologist for a painless swelling of the right testicle, which was removed and found to be an embryonal carcinoma (Fig. 1).

Examination.—The patient's upper jaw was edentulous and normal in appearance. Roentgenographic examination of the mandible disclosed a horizontal impacted lower left third molar. The usual low grade type of infected granulation tissue was present. It was thought that this tooth was causing reflex pain in the maxilla.

Operation.—The patient was hospitalized in November 1935, and anesthetized with Avertin and ether. The impacted tooth was removed. The operation and recovery were uneventful.

Outcome.—In March 1936, the patient returned, complaining of pain and swelling in the left side of his face. There was a thick yellowish discharge from the mandible at the site from which the impacted molar had been removed, and a bronchial type of cough had developed with very little sputum. Hospitalization was advised for medical and roentgenographic treatment, but the patient refused.

One month later he was admitted to the hospital with acute urinary retention, fecal impaction and loss of weight and strength.

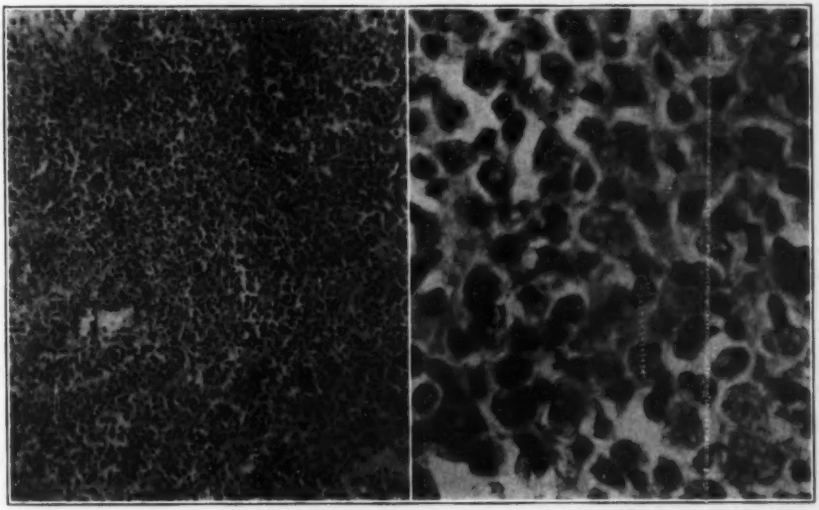

Fig. 1.—Left: Low power photomicrograph of tumor of testicle. Right: High power photomicrograph of same tumor. There is a marked similarity to type of tumor cells in Figure 3

Fig. 2.—Lateral roentgenogram of the jaw, showing destruction of mandible caused by metastatic carcinoma of testicle

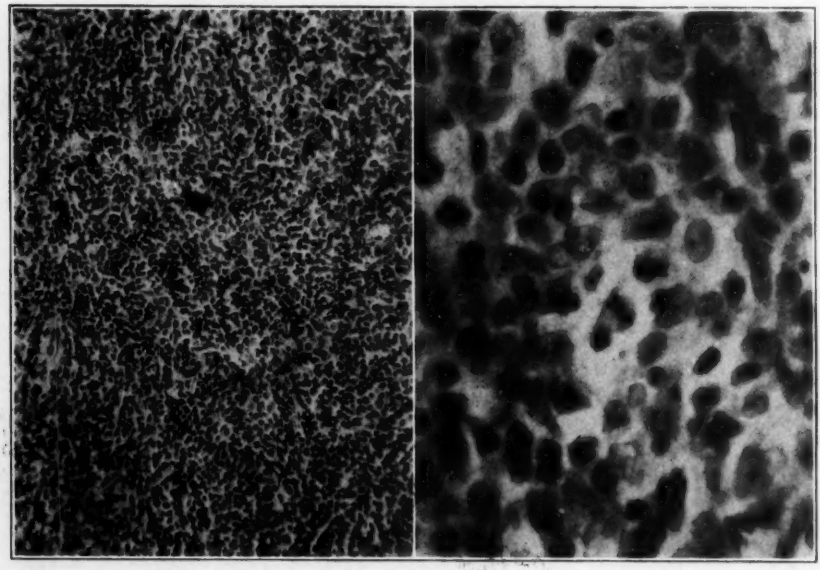

Fig. 3.—Left: Low power photomicrograph of undifferential carcinoma of mandible. Right: High power photomicrograph

Examination.—The patient had no fever. Urinalyses were negative, and blood pressure ranged from 100/70 to 160/90. His pulse was elevated from 90 to 108. The lungs were clear. The heart was slightly enlarged to the left and there was a systolic murmur at the apex. Report on examination of the abdomen was essentially negative. Action of the extremities, knees and hip joints was definitely limited because of osteo-arthritis. There was a thick purulent drainage from the mandible into the mouth.

Roentgenographic Examination.—The lungs were negative and there was no evidence of pleural exudate. Films of the left side of the mandible showed a large destructive lesion just anterior to the angle in the left third molar region (Fig. 2). There was almost complete destruction of the bone in this region, and, according to the roentgenologist, pathologic fracture. The appearance was that of osteomyelitis, but malignancy was a possibility.

Operation.—In view of the x-ray findings, the patient was prepared for operation. Anesthesia was induced with Avertin and nitrous oxide. The left molar region was exposed, and some alveolar bone was removed, uncovering a large, white, firm mass of tissue within the cortical plate. Some of the tissue was gray and comparatively soft. It did not resemble in any way the granulation tissue found in osteomyelitis, but rather a neoplastic mass.

Pathologist's Report.—Metastatic carcinoma of the mandible (Fig. 3).

Outcome.—The patient was given postoperative x-ray treatment which produced a marked reaction of the skin on the cheek and neck. The operative area broke down into a sloughing mass.

The patient's general condition became less favorable, and on May 8, 1936, extensive congestion of the lungs occurred. Coma and death ensued.—*269 South Nineteenth Street.*

PENICILLIN: ITS USE IN SURGERY AND INFLUENCE ON EARLIER TYPES OF CHEMOTHERAPY

It is evident that the sulfonamides and penicillin are very effective and useful agents in the treatment of many infections commonly encountered in the practice of surgery. Penicillin is far superior to the sulfonamides in the treatment of infections caused by the staphylococcus and it has been particularly useful in the cases of infection caused by sulfonamide resistant gonococci, hemolytic streptococci and pneumococci. It is also the chemotherapeutic agent of choice in gas gangrene, ratbite fever, actinomycosis, anaerobic streptococcal infections, and human bite infections. The use of increasingly large doses of penicillin, permitted by its very low toxicity, is gradually extending the field of effective chemotherapy in other infections produced by less susceptible bacteria. Penicillin has been strikingly effective in diffuse or generalized staphylococcal infections which have been diagnosed and treated early with penicillin, with the exception of those caused by a resistant strain or those complicated by acute vegetative endocarditis. The early treament of diffuse infections caused by the staphylococcus or streptococcus often was followed by such prompt and complete arrest of the destructive bacterial process that suppuration did not develop and surgical intervention either became unnecessary or limited to more localized measures. In the management of suppurating surgical infections caused by susceptible bacteria, penicillin therapy has had a striking beneficial effect on mortality and morbidity, but the fundamental surgical principles of early accurate diagnosis, early treatment, rest, adequate external drainage, correction of altered physiology and vigilant supportive treatment remain as important as ever.—W. A. Altemier and C. L. Wadsworth, in *Surg., Gynec. & Obst.* **84**:540 (April 15) 1947.

IMMEDIATE AND FATAL SEPTICEMIA AFTER TOOTH EXTRACTION

W. T. Ewing, D.D.S.,
Akron, Ohio

History.—The patient was a well developed and well nourished white man with a well localized infection of the lower right third molar. The infection was of three days' duration. When the patient was first seen, on January 28, 1942, his temperature was normal.

Treatment.—The patient was given nitrous oxide and oxygen, and the infected tooth was extracted. There was definite relief from pain, and the patient was given the usual postoperative instructions and medications.

That evening the patient's wife telephoned that he was in great discomfort locally and "appeared to be having chills." I found the patient in acute distress, chilling and with a temperature of 102.9 F. He was admitted immediately to the hospital.

Physical findings were negative except for the infected mandible and high temperature.

Routine treatment of hot compresses, irrigations, sedation and fluids was instituted, as well as chemotherapy with sulfathiazole and sulfanilamide.

Outcome.—The treatment was continued, and, although the patient's course continued to be stormy, adequate drainage had been established intra-orally. The swelling subsided except for a large nodule anterior to the upper third of the anterior belly of the sternomastoid muscle.

Because the patient's spiked temperature continued, blood cultures were made. On February 5, a laboratory report stated the blood to be positive for Streptococcus viridans. Blood cultures were made at intervals of two days. They remained positive. The patient's blood was cross-matched with that of donors, but he was not given a transfusion at this time.

On February 12, blood cultures were negative for Str. viridans, and the patient appeared to be generally improved.

At 8 a.m., February 14, the patient's temperature rose but returned to normal by noon. During the afternoon and evening his temperature began to rise again, and at 12 p. m. the nurse heard the patient struggling. When she reached him, large quantities of blood were gushing from his nose and mouth. He died within two to three minutes.

Summary.—This case is of interest because of the immediate and continued septicemia which followed extraction of the patient's infected tooth. In reviewing the case, I now realize that the patient had a deep-seated abscess of the neck. In time it eroded into the carotid sheath and through the medial wall of the external carotid artery. Following the lines of least resistance, the hemorrhage, pushed by the tremendous pressure of the blood column, occurred in the mouth immediately after rupture of the arterial wall. Although the abscess was never fluctuant superficially, I am certain that if it had been incised shortly after it appeared as a residue of the original infection, the termination of this case would have been different.—*710 Akron Savings and Loan Building.*

SURGICAL REMOVAL OF ABERRANT TEETH: REPORT OF TWO CASES

Charles McKenzie, M.D., D.D.S.,
Spokane Wash.,
and D. H. Sharpless, D.D.S.,
Everett, Wash.

Frequently the location and removal of malposed teeth have contributed immeasurably to the relief of pain about the head, face and neck. Experienced exodontists and oral surgeons encounter such cases almost daily.[1] However, in many years of practice, we have never seen cases similar to those reported here.

Case 1

History.—A woman, aged 46, complained of intermittent pain and swelling in the right temporomandibular region, lasting over a period of three years.

Fig. 1.—Condylar impaction involving capsule of temporomandibular joint

1. Nodine, A. M., Impacted and Aberrant Teeth: Their History, Causes and Treatment. *D. Items Interest* 68:30 (January through December) 1946.

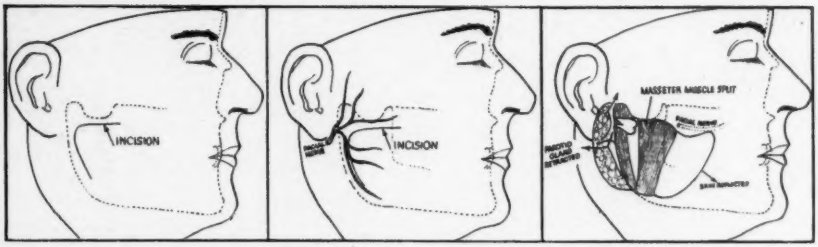

Fig. 2.—Operative procedure followed in Case 1

Fig. 3.—An ill-defined mass may be seen on floor of orbit

Examination.—The area in front of the ear on the right side was swollen and indurated. Oral examination revealed impairment of motion of the temporomandibular joint. Any effort to open the mouth beyond a limited point was accompanied by severe pain. X-ray examination showed an unusual location of the unerupted third molar, which was lying horizontally in the condyle (Fig. 1).

Operation.—With the patient under Pentothal sodium anesthesia, a horizontal incision was made on the level of the lobe of the ear for a distance of 1¼ inches ending about ¼ inch in

Fig. 4.—Anteroposterior view of region shown in Figure 3

front of the ear. This incision was turned sharply downward and forward along the posterior margin of the mandible (Fig. 2). The skin and subcutaneous tissues were raised and directed downward, and the anterior margin of the parotid gland was defined. The gland was retracted back and up, exposing the masseter muscle, whose fibers were split, and the neck of the condyle. The tooth was carefully loosened and removed.

Remarks.—One has the choice of several incisions in approaching the neck of the condyle.[2,3] The one described has, in our experience, offered the safest approach to the condylar region. There are three major complications to be avoided in the removal of a tooth from this location: injury to the facial nerve, which results in facial paralysis; injury to the parotid duct or gland, with subsequent salivary fistula, and fracture of the neck of the condyle. The only complication after this operation was a moderate parotitis from surgical trauma, which subsided in two weeks.

Case 2

History.—A man, aged 35, complained of marked soreness in the left maxillary region. He had been operated on a year previously for maxillary sinusitis on the left side.

Examination.—Physical and x-ray examination revealed the typical signs and symptoms of maxillary sinusitis (Fig. 3).

Operation.—A Caldwell-Luc operation was performed, the maxillary sinus was explored and a pus-like edematous membrane was removed. There was no evidence of any foreign body within the maxillary sinus cavity. An area of the floor of the orbit, however, appeared darker than the remaining floor and yielded to slight pressure. By manipulation a mass was freed from the surrounding structures. Examination revealed an incompletely developed molar tooth surrounded by calcareous deposit, which no doubt accounted for its poorly defined outline. The patient's recovery was uneventful.

2. Thoma, K. H., *Traumatic Surgery of the Jaws.* St. Louis: C. V. Mosby Company, 1942.
3. Fomon, Samuel, *Surgery of Injury and Plastic Repair.* Baltimore: William & Wilkins, 1939.

Remarks.—This case showed several interesting features. The rare location of the tooth and the fact that it escaped recognition were responsible for failure of the first operation. No orbital symptoms were experienced by the patient at any time, which, in the light of the history, is difficult to explain. An anteroposterior roentgenogram (Fig. 4), shows no definite sign of the mass, although the angle at which the film was exposed and the poorly developed state of the tooth enamel could account for its showing only on lateral exposure.—*581 Paulsen Building.*

THE IMPORTANCE OF BLOOD IN PREOPERATIVE AND POSTOPERATIVE TREATMENT

In order to carry on the important functions of the blood and to meet emergencies such as sudden loss of blood, trauma and major operations, an adequate volume of circulating blood must be maintained and enough hemoglobin must be maintained in the erythrocytes to supply oxygen to the tissues. The effects of sudden hemorrhages such as occur in peptic ulcers, placenta previa, ruptured ectopic pregnancies, ruptured uteri and pulmonary tuberculosis, may be offset by transfusions of blood. The use of transfusions of blood before operation to minimize or to prevent shock in such cases and to prepare patients who have jaundice or hemorrhagic diseases is generally accepted. In the obstetrical emergencies Rh negative blood should be given when the Rh type has not been determined previously.

It has been found that transfusions of blood will decrease coagulation time. Since transfusion of 100 cc. of fresh blood usually is enough to produce a hemostatic effect, a preoperative transfusion may make surgical procedures possible in conditions such as jaundice or certain blood dyscrasias in which they would otherwise have been impossible.

Usually a patient with acute or chronic anemia has a marked decrease in blood volume in which case fewer erythrocytes are present to carry oxygen and carbon dioxide, and because of the necessity for increased cardiac output the heart may be strained. A patient who has either acute or chronic anemia may reach the stage of air hunger as a result of the anemia. Anemia may result from slow loss of blood in conditions such as menorrhagia, slowly bleeding ulcer, and rectal disorders (hemorrhoids or neoplasms). If the patient with this type of anemia undergoes operation, trauma or further loss of blood, irrespective of the type of anesthesia, shock, or permanent cerebral damage may ensue because oxygen supply to the brain is insufficient.

In the postoperative period certain additional conditions may be present in which blood transfusions may prove of value. Favorable results of transfusions in treatment of certain infectious diseases have been reported.

The purpose is to add such antibacterial agents as natural antibodies, leukocytes and complement to the blood of the recipient. Immunotransfusions may have even more value.—Thomas H. Seldon, in *Surg., Gynec. & Obst.* **84**:1124 (June) 1947.

PENICILLIN IN THE TREATMENT OF OSTEOMYELITIS: REPORT OF CASE

Albin R. Hagstrom, D.D.S.,
Brooklyn, N. Y.

History.—On May 15, 1946, a well developed boy, aged 14, was referred for diagnosis and treatment of an acute swelling of the right side of the mandible. A week earlier, the patient had had pain and tenderness involving the lower right molar and bicuspid teeth. When the pain became more severe, and a swelling appeared in the region, the patient went to his dentist. Intra-oral films were taken, and the swelling in the mucobuccal fold was incised and drainage was established, since when a constant purulent discharge had persisted. On questioning, the patient said that he had been struck on the right side of the mandible with a baseball one month earlier but had experienced no unusual symptoms aside from moderate tenderness which disappeared within a few days.

Examination.—The patient was stocky in build, and alert, and, while obviously feeling some discomfort, he did not appear acutely ill. Oral temperature was 100.1 F.

The swelling was of the diffuse edematous type, involving the entire right side of the face as high as the zygomatic arch. Palpation revealed no fluctuation or localization of infection. The submaxillary and cervical nodes were discrete and tender, and the mandible in the molar area was acutely sensitive to pressure.

Intra-oral examination showed the alveolar and buccal mucosa in the molar area to be inflamed and somewhat swollen. Digital pressure on this area brought a thin purulent discharge from the opening of the incision. Exploration with a fine curet revealed an extensive region of destruction of bone. The first molar and second bicuspid were tender to percussion but gave normal responses to vitality tests. Other findings from oral examination were essentially negative. The occlusion was good, the oral hygiene was excellent and the teeth showed good restorations.

Intra-oral and lateral roentgenograms revealed a region of marked bone destruction, 3 cm. in length, extending from a point 1 cm. below the alveolar crest to the cortical bone on the inferior border of the mandible. The apexes of the second bicuspid and first molar appeared to be involved (Fig. 1, left).

Diagnosis.—Osteomyelitis of traumatic origin.

Treatment.—A quarter inch gauze drain was inserted in the incision already present, and the patient was instructed in the home use of oral irrigations with saline solution. Oral penicillin tablets, 300,000 units a day, and suitable analgesics were prescribed.

Fig. 1.—Left: Region of destruction of bone is shown (May 15, 1946). Center: Development of pronounced deformity may be seen (June 7, 1946). Right: Consolidation of region of destruction and sharp definition of borders are shown (August 10, 1946)

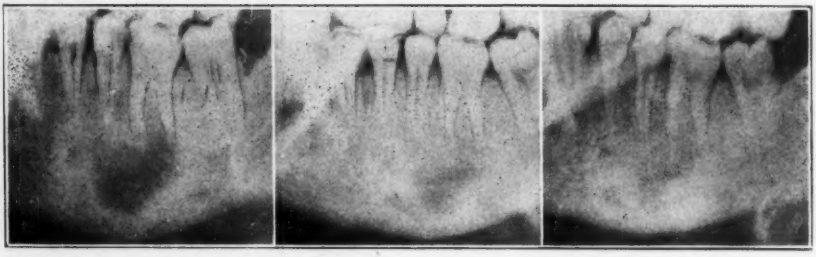

Fig. 2.—Periodic roentgenograms showing progress of recalcification. Left: September 10, 1946. Center: October 8, 1946. Right: October 22, 1946

Course.—The patient returned to the office two days later for treatment. His temperature had returned to normal, and the swelling had subsided slightly, but the profuse drainage persisted. On the fifth day, acute symptoms had subsided and the lymph nodes were no longer palpable. Oral administration of penicillin was discontinued.

Some consideration was given at the time to the advisability of removing the second bicuspid and the first molar. However, since these teeth appeared vital and were not contributing to the infection, it was decided to retain them and pursue a conservative course of treatment. For two weeks the patient came to the office every second day to have the drain changed and the area irrigated with saline solution.

On June 7, a lateral roentgenogram (Fig. 1, center) revealed more extensive destruction of bone, especially in the cortical layer, with the development of a pronounced deformity. Radiolucency was more marked, but no evidence of sequestration could be noted. Clinically the swelling was practically gone, and the patient was free of pain. A constant discharge persisted.

Treatment.—Local treatment with penicillin was instituted, consisting of daily submucous injection of 10,000 units of penicillin directly into the region of bone destruction. The injections were made with a hypodermic needle which was inserted at right angles to the body of the mandible through intact mucous membrane just anterior to the fistulous opening. The needle passed readily into the bony cavity where the solution of penicillin was discharged. During the first few injections some of the solution returned through the fistulous tract, but, after the opening had healed, the injection caused merely a slight swelling which subsided within twenty minutes. As the healing progressed, and after the bony cavity had become obliterated, the injections were made through the mucobuccal fold alongside the body of the mandible in the region where the lesion had existed. This was the only treatment used. As the patient progressed, the number of injections was reduced to three and then two a week. Fifty-two injections were given.

Progress.—Response to this treatment was truly dramatic. After only five injections the discharge had stopped completely, the drains were discontinued and the incision closed with no subsequent swelling or evidence of fluid pressure. Intra-oral findings were completely negative.

Roentgenographically improvement was slow compared to the remarkable clinical response. The roentgenogram taken on August 10 showed a marked change in the osseous structure of the lesion. The region of destruction appeared more consolidated and the borders more sharply defined. The cortical bone, while still deformed, showed slight evidence of recalcification, but the cancellous bone remained mottled with several areas of radiolucency (Fig. 1 right).

Outcome.—Progress was steady and uneventful. There were no further subjective or clinical symptoms of the disease.

Periodic roentgen examination showed that definite progress in the reparative process was taking place. Recalcification can easily be seen in Figure 2.

By October 25, 1946, bone regeneration was practically complete. As a prophylactic measure weekly injections of penicillin were continued for about six weeks, and periodic roentgenograms are planned to determine any subsequent changes in the bone.

UMI

Comment.—At a time when more specific therapeutic uses of penicillin are being sought, the gratifying results obtained in this case seem significant. The successful outcome of a case of osteomyelitis without surgical interference or sequestration, achieved by the injection of penicillin directly into the diseased region, indicates the definite value of such treatment for this disease. —*80 Hanson Place.*

MANAGEMENT OF JAW FRACTURES

An analysis of fractures of lower and upper jaws is submitted. These fractures were of two types, namely, civilian type and those due to gunshot wounds. Types of fixation are indicated in their respective frequency of employment.

With careful debridement associated with penicillin and chemotherapy and by carefully planned closure of soft tissue wounds, it was possible to avoid much soft tissue deformity. Similarly, in comminuted fracture of the mandible, treatment consisted of careful debridement of all planes of the wound, especially aimed at removal of any bone fragment without soft tissue attachment or with doubtful blood supply, obliteration of dead space, and complete closure of the overlying soft tissue without drainage. Following this procedure, there was rarely any further sign of infection necessitating further debridement. Bone grafting was done within a month after primary closure in those cases in which it was indicated, and was practically always successful with minimal complications.

Secondary hemorrhage was rare, probably due to adequate surgery and avoidance of infection. Penicillin and chemotherapy are of great value in limiting infection, but the greatest factor is still careful surgery.

In civilian type fractures with nonunion or in fractures with a gap of less than ½ inch, bone graft was of medullary chips from along the iliac crest. In larger gaps, a block of cortical and medullary bone was wired firmly to both fragments of mandible, supplemented by medullary chips beneath it and around the ends.

Some practical suggestions regarding the care of wounds of this kind and regarding dietary requirements are included.—Lyman T. Barclay, Stuart D. Gordon and H. Hoyle Campbell, in *Surg., Gynec. & Obst.* 84:973 (May) 1947.

ASPIRATION BIOPSY OF LYMPH NODES

Aspiration biopsy in our experience provides a reliable, safe, rapid and economical method of investigating lymph node enlargements, the accuracy of which, within limits of application, very creditably approaches that of other similar diagnostic procedures. The greatest value of the method lies in the evaluation of nodes suspected of being the site of metastatic disease, particularly those regional nodes approximating foul and infected primary lesions. The diagnosis of lymphomas was invariably suggested, but exact classification could not consistently be made.

The relative merit and indications of incisional or formal biopsy are adjunctive rather than competitive. The decision as to operability or inoperability or the choice of treatment is facilitated by the establishment of the presence or almost certain absence of metastases in enlarged nodes.

Aspiration biopsy also provides an accurate method of determining the presence of metastasis in patients to be treated by roentgenotherapy and the size of the field may be chosen accordingly. Empirical treatment based on clinical judgment alone can be avoided, as well as the delay in treatment occasioned by waiting for an incision to heal.

It should be emphasized that the diagnoses which were made in these aspiration biopsies were based entirely on paraffin sections and not on smears.

Successful aspiration biopsy as a safe and reliable diagnostic procedure is a product of the combined resourcefulness, the clinical acumen, the technical ability, and the mutual sympathetic co-operation of surgeon and pathologist who are trained to recognize malignant disease. —R. E. Meatheringham and Lauren V. Ackerman, in *Surg., Gynec. & Obst.* 84:1071 (June) 1947.

UMI

COMPOUND COMMINUTED FRACTURE OF THE MANDIBLE: REPORT OF CASE

H. N. Magee, D.D.S.,
Oklahoma City

History.—An oil field worker, aged 42, was injured in the head and about the face by fragments of an exploding acetylene tank. He was taken to a local hospital for emergency treatment and dismissed nine days later. When admitted by ambulance to the second hospital, he was semiconscious because of the action of the narcotics given for pain relief.

Examination.—On April 14, 1944, the patient was irrational. There appeared to be no paralysis that might accompany a head injury of this nature. Roentgenograms (Fig. 1) showed a compound comminuted fracture of the lower left side of the mandible. There were several loose fragments and a marked displacement. A number of teeth were loose and the skull was fractured. In the left side of the face along the margin of the jaw there was an opening large enough to admit an English walnut. There was considerable drainage from this lesion, and the patient was suffering great mental confusion and inability to follow through with his thoughts. His condition was unsatisfactory for even minor operation.

Treatment.—On April 21, a semiplastic repair was carried out on the left side of the face, and partial reduction of the fracture was accomplished with Barton's bandage combined with rubber traction. The patient's temperature averaged about 100 F. on April 24. A small draining point had opened at the site where closure had been made on the left side of the face, and there was some consolidation of the lungs. The mental confusion was still present.

Additional reduction of the mandible was performed with the aid of elastic traction on April 27. Mandibular and maxillary arch bars were placed, but we were unable to close the jaws or bring about occlusion because of extreme edema of the patient's throat. The condition of the patient was poor.

Progress.—By May 1, the general condition of the patient had improved, but reduction of the mandible was still impossible because of the mental condition of the patient and his severe re-

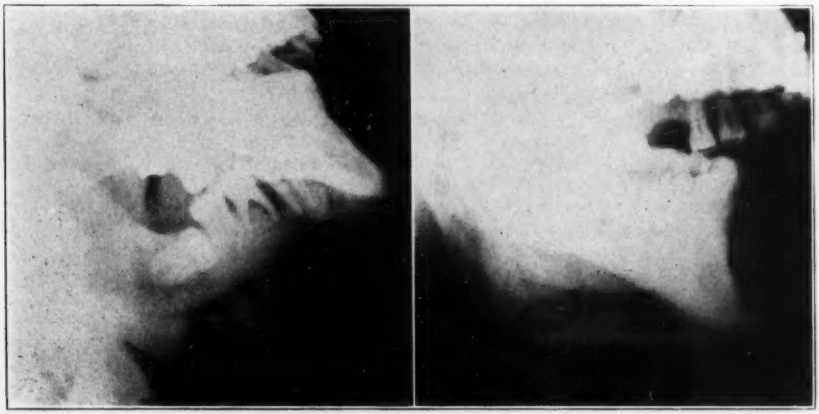

Fig. 1.—Left: Comminution of body and lower border of mandible is shown. Right: More direct lateral view showing displacement by retrusion

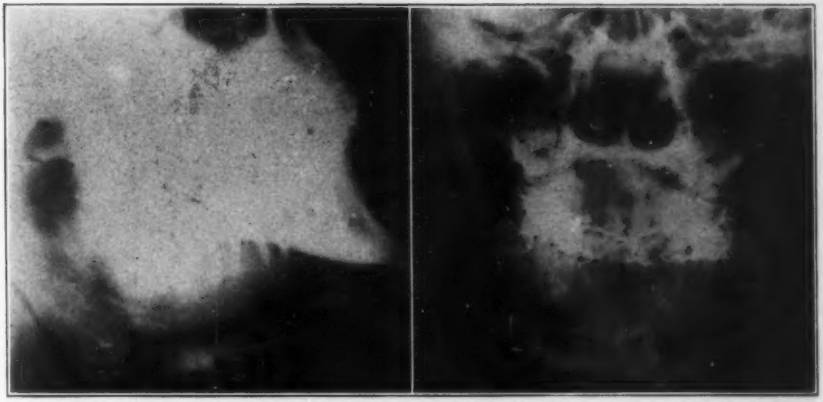

Fig. 2.—Left: Lateral view showing correction of posterior displacement, and fragment of lower border of mandible that subsequently formed a sequestrum. Right: Intermaxillary wiring and comminution of mandible are shown

Fig. 3.—Left: Appearance of patient before removal of sequestrum. Right: Appearance after healing of tissues

action to the original wiring. Penicillin 10,000 units was administered and continued every four hours after the sulfonamides had been ineffective. Favorable response was immediate and dramatic. Intermaxillary wiring with rubber traction and intra-oral fixation with an extra-oral splint and headcap corrected the posterior displacement (Fig. 1, right) and obtained excellent alinement, and the teeth were brought into good occlusion (Fig. 2).

On May 8, the patient's general condition was good. The wounds were healing, and intramuscular administration of penicillin was discontinued. After this date, only irrigation of the external fistula was carried out. The patient's progress was excellent and he was dismissed from the hospital on May 17, with osteomyelitis of the jaw and sequestration of the lower left side of the jaw. The patient was instructed to return at given intervals for recheck.

Follow-up Examination.—On June 20, roentgenograms showed gradual improvement of the

Fig. 4.—Appearance of mandible after removal of sequestrum

left side of the jaw. When the patient was seen on July 17, progress was excellent and his general condition was good. It was decided to postpone reduction of the depressed fracture of the frontal area until the jaw was healed.

On August 14, one tooth and the wire were removed from the jaw. Although sequestra were present, the patient's condition was good. A roentgenographic examination, on August 25, revealed one large sequestrum in the lower left side of the jaw. The patient was able to eat solid foods and his occlusion was excellent. He was requested to return in thirty days for removal of the sequestrum.

On November 3, the patient was admitted to the hospital with a large sequestrum extruding from the lesion on the face. He was given a local anesthetic, and the sequestrum was removed (Fig. 3, left). On November 31, there was no drainage from the left side of the mandible (Fig. 3, right). The general alinement and occlusion of the teeth were good, and there was an almost normal range of motion of the left side of the jaw. Some weakness of the left side was caused by loss of bone (Fig. 4).

Result.—The good results in this case are attributed to proper hospital and nursing care of the patient, to the fact that we did not rush reduction and wiring of the jaw and to the use of penicillin to inhibit further progress of the osteomyelitis.—*1214 Medical Arts Building.*

REMOVAL OF OSTEOFIBROMA: REPORT OF CASE

John M. Marré, D.D.S.,
St. Louis

A woman, aged 47, was referred to our office by her dentist on August 19, 1941, for examination of a peculiar growth which was hanging in her mouth.

History.—The patient gave no information other than the fact that she had had no discomfort and was not aware of the growth in her mouth. To the best of her knowledge no third molar had ever been extracted.

Examination.—A pedunculated tumor, 9 mm. long, 5 mm. wide at the head and with an attachment of about 2 mm. was attached to the middle of the alveolar ridge at a point which would normally be the position of the maxillary left third molar. The growth was almost touching the occlusal surface of the corresponding lower third molar. The epithelial covering was identical in color and texture to the corresponding mucosa. There was no apparent inflammation.

Roentgenograms revealed a highly unusual condition. My first impression was that a small supernumerary tooth had developed outside the maxilla within a pear-shaped soft tissue tumor. The roentgenogram showed a small tooth-like body posterior to the second molar (Fig. 1).

Operation.—Two approximating elliptical incisions were made, extending through the mucoperiosteum at the base of the tumor. The mass was removed, and the underlying bony area was curetted thoroughly. The lateral margins of the mucosa were elevated, moved over into approximation and sutured. Healing was uneventful.

Histologic Findings.—Microscopic examination revealed a pedunculated fibroma harboring a network of broad and dense bone trabeculae (Fig. 2). This formation formed an almost solid mass, filling the entire head of the tumor. The bone formation was surrounded by a fibrous tissue which was very densely arranged. This fibrous mass was covered by a squamous

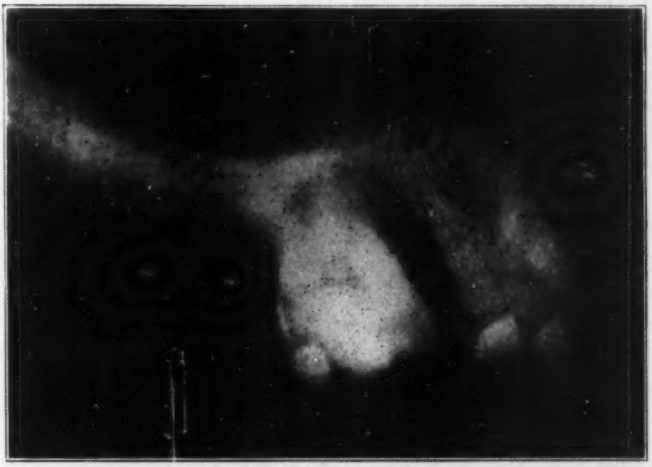

Fig. 1.—Preoperative dental film showing small radiolucent area outside of maxilla

Fig. 2.—Left: Low power photomicrograph of tissue of osteofibroma. Right: High power photomicrograph

epithelium, the proliferations of which revealed a normal relation to the underlying tissue. However, various areas were infiltrated heavily by small round cells, particularly around the dilated capillaries. In these areas, the proliferated epithelium extended into the upper parts of the fibrous wall.

The surface of the bony nucleus showed osteoclastic resorption in the area of inflammation. Other parts of the surface showed deposition of new bone. The bone trabeculae themselves showed deeply stained incremental and resorption lines, thus proving the genesis of inflammatory bone formation. This conception was supplemented by the contents of the bone marrow spaces which contained a fibrous tissue with dilated blood vessels that were surrounded by infiltration of small cells. The surfaces of the surrounding trabeculae were coated partially by osteoblasts and partially by more or less typical osteoclasts. There were rows of osteoblasts and osteoclasts that were detached by edema from the bony surface.

Pathologic Diagnosis.—Osteofibroma with inflammatory changes.—*634 North Grand Boulevard.*

REMOVAL OF IMPACTED THIRD MOLAR FROM ANTRUM: REPORT OF CASE

Alvin L. Armer, D.D.S.,
Hollywood, Calif.

On February 10, 1945, a white woman, aged 28, was referred by her dentist for removal of a nonvital maxillary right second molar and the impacted third molar. The general physical history was negative.

Examination.—Clinically, the oral cavity showed no abnormalities. The gingival tone and occlusion were normal. The patient's blood pressure was 118/76, her temperature was 98.6 F. and the quality and rate of pulse were within normal limits. Roentgenographic examination disclosed that a malformed, partially developed third molar, approximately half the normal size and shaped like a lower bicuspid, was totally impacted and inverted into the distal wall of the antrum (Fig. 1). The density of the bone was within normal limits.

Treatment and Course.—The patient was anesthetized with nitrous oxide and oxygen, and an incision was made from the posterior aspect of the tuberosity to the mesial border of the first molar. The mucoperiosteal flap was reflected, and a chisel with mallet force was used to remove the osseous structure over the impacted tooth. When some of the bone was removed, the cavity of the tooth was located. It was assumed that the tooth had been forced into either the infratemporal fossa or the antrum. Therefore, the nonvital second molar was removed as planned and a more thorough examination of the antrum was made. Since the sinus membrane was not broken, it was surmised that the tooth was not in the antrum. Intra-oral roentgenograms failed to locate the tooth, so the mucoperiosteal tissues were coapted and sutured. The patient was awakened, and the necessity of extra-oral roentgenograms was explained.

Examination.—On February 13, 1945, roentgenograms disclosed that the tooth was situated in the antrum just beneath the orbit and the posterior wall (Fig. 2). It now appeared that the tooth had passed into the sinus in an upward and inward direction but had stayed between the sinus membrane and the wall.

Treatment and Course.—On February 22, the patient was anesthetized with nitrous oxide

Fig. 1.—Preoperative view of impacted molar

Fig. 2.—Left: Lateral view showing upper third molar displaced into antrum. Right: Antero-posterior view of same tooth. Insert: Photograph of upper third molar which was displaced into antrum

and oxygen, the incision was reopened and a curet was used to maneuver the tooth back down the same channel and deliver it (Fig. 2, insert). The mucoperiosteum was sutured to place. The patient's recovery was accompanied with the usual amount of edema and discomfort.—*6331 Hollywood Boulevard.*

GRADUATE TRAINING IN SURGERY

In tracing the progress made in the manner of treating the basic medical sciences since even the more recent prewar years, several important tendencies are evident. Among these are greater emphasis on the basic sciences, other than anatomy and pathology, which include biochemistry, physiology, bacteriology and pharmacology, and upon clinical rather than didactic teaching. The review courses have given way to the study of these more or less exact sciences as they bear directly on clinical procedures. The necessity of adequate knowledge of the applied basic medical sciences being established, the problem shifts to the hospitals in which the training programs are prepared and carried on. Frequently this calls for cooperation between the hospital and the medical school.—Charles R. Reynolds, in *Surg., Gynec. & Obst.* 84:886 (April 15) 1947.

UMI

TREATMENT OF MANDIBULAR FRACTURES BY EXTERNAL FIXATION

Robert M. Booth, D.D.S.,
Springfield, Ill.

The most satisfactory method for the immobilization of a fractured edentulous mandible is the extra-oral fixation. This method which has existed since the beginning of the century has become a highly successful approach to the treatment of fractures. It has proved to be comfortable for the patient and allows him to resume a reasonably normal routine. It requires a minimum amount of medical care and results in accurate reduction.

The treatment of fractures is basically mechanical. The muscular strains and stresses involved in fractures make it necessary for the dentist to have a competent knowledge of the anatomy of the face.

Anatomy

The fractured mandible is modified by the direction of blow, the line of fracture and the direction of muscle pull. A knowledge of the action of these muscles is necessary for proper reduction and fixation of the fragments. Four directions of force are considered: medial, lateral, depressive and elevational. Each muscle group tends to displace the fragment in the direction of its action (Fig. 1, left).

The temporalis muscle arises from the deep surface of the temporal fascia and the whole of the temporal fossa except that part of it formed by the zygomatic bone. The fibers of this fan-shaped muscle converge to insert into the coronoid process of the mandible, passing along the anterior border of the ramus as far forward as the third molar tooth. It is a powerful elevator of the mandible and because of its insertion forward along the anterior border of the ramus offers a backward as well as upward force (Fig. 1, right).

The masseter muscle is a thick quadrilateral muscle, the superficial portion arising from the anterior two-thirds of the lower border of the zygomatic arch. The deep portion arises from the posterior third of the lower border and the whole of the medial surface of the zygomatic arch. It inserts into the angle and the lateral surface of the ramus of the mandible. The superficial fibers, having a backward direction, assist in a slight forward motion of the mandible. The masseter is one of the most powerful elevating muscles of the jaw.

The external pterygoid muscle is relatively short and thick, arising in two heads. The superior head arises from the lower part of the lateral surface of the great wing of the sphenoid bone and from the infratemporal crest. The fibers of the lower head arise from the lateral surface of the external pterygoid plate. The fibers pass laterally and backward to insert into the fibrous capsule of the temporomandibular joint and in a depression in front of the neck of the mandibular condyle.

Because the fibers of the pterygoid muscle arise at a point further forward than their point of insertion, the pterygoid muscle draws the mandible forward during contraction, and the superior head exerts a slight upward pull (Fig. 2). The ex-

Research conducted under grant-in-aid from Loyola University, New Orleans, La., and from the Carnegie Foundation.

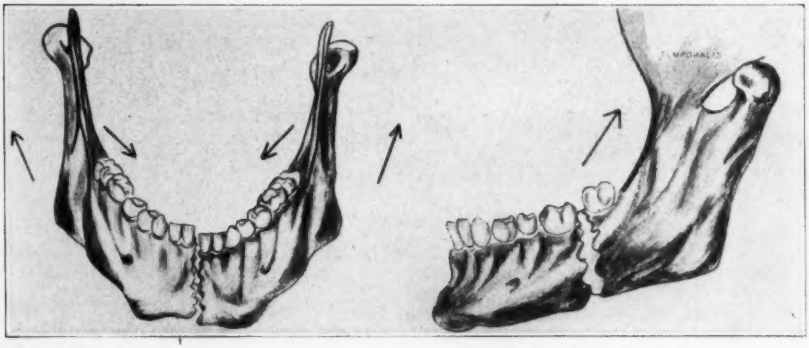

Fig. 1.—Left: Directions of force of four sets of muscles. Medial displacement is caused mainly by muscle groups attached to medial surface of mandible. Lateral displacement is caused by those muscles attached to lateral surface. Muscles attached to anterior part of jaw (depressors) tend to pull fragments downward. Elevation of fragment is caused by powerful elevator muscles of mandible, the masseter and temporalis. Right: Direction of muscle pull. Temporalis muscle is a powerful elevator of the mandible, and because of its most forward insertion it offers a slight backward force

ternal pterygoid muscles functioning together open the mouth. When acting separately the alternate contractions of the external pterygoid muscles rotate the mandible from side to side.

The thick quadrilateral internal pterygoid muscle arises from the medial surface of the external pterygoid plate and the pyramidal process of the palatine bone. The insertion of this muscle is into the lower and back part of the medial surface of the ramus and angle of the mandible. Its primary function is the elevation of the mandible. Because of the backward direction of the fibers a slight protraction of the mandible results (Fig. 3). Acting separately the internal pterygoids assisted by the external pterygoids move the mandible from side to side. The internal pterygoid augmented by the masseter straps the ramus of the mandible between the two muscles. The combined action of these muscles prevents a pronounced displacement of the posterior fragment when this portion of the jaw is fractured. However, the usual slightly buccal inclination of the posterior fragment is explained by action of the relatively stronger muscle, the masseter.

The Suprahyoid Group

The genioglossus muscle is a fan-shaped muscle arising from the mental spine of the mandible. Directed almost horizontally backward, a portion of the muscle inserts into the lingual fascia. The inferior fibers attach to the superior border of the hyoid bone.

The geniohyoid muscle is a strap-shaped muscle arising from the inferior mental spine, running backward and slightly downward and inserting into the anterior surface of the body of the hyoid bone. This pair of muscles exerts a downward and backward pull in fractures of the mandible (Fig. 4, left).

The digastric muscle consists of two bellies, an anterior and a posterior. The anterior arises from the digastric fossa of the mandible, and the posterior belly arises by a tendinous process from the mastoid notch of the temporal bone. The two bellies end in a tendinous insertion of the hyoid bone. This muscle tends to pull the anterior

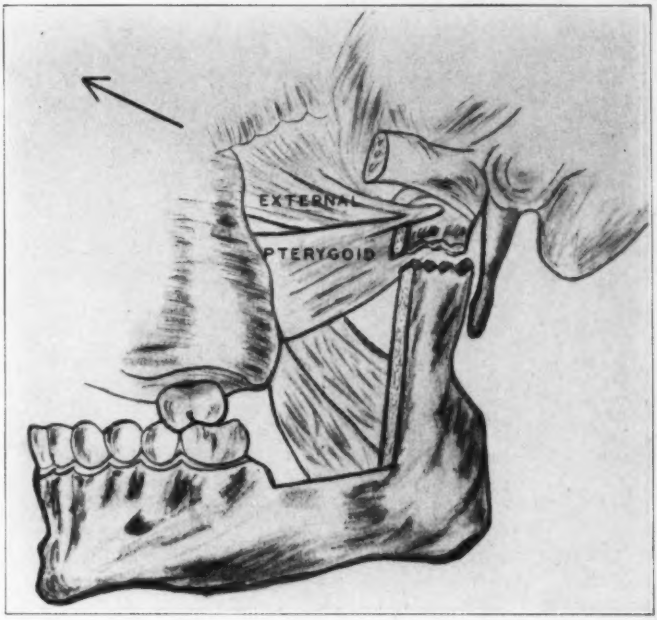

Fig. 2—Superior head of external pterygoid muscle. This muscle draws the mandible forward. Superior head exerts a slight upward pull as shown by arrow

fragment of the mandible downward and backward.

The flat mylohyoid muscle forms the muscular floor of the mouth. It arises from the whole length of the mylohyoid line of the mandible and converges to insert into the anterior surface of the body of the hyoid bone and into the median raphe. Because of its extended linear origin it tends to draw fragments of mandibular fractures downward and inward (Figs. 3 and 4, right).

Blood Vessels

The external maxillary artery branches from the external carotid artery just above the greater cornu of the hyoid bone and passes upward, crossing the body of the mandible at the anterior border of the masseter muscle. A groove may be palpated at the inferior border of the mandible where this artery passes upward and over the face. The artery is accompanied by the anterior facial vein and is given special consideration in placing the pins of the splint. The point of insertion of the pins should be at least one half inch on either side of the vein and artery (Fig. 5).

The inferior alveolar artery, the vessel which supplies the teeth, is located in the mandibular canal. The artery is accompanied by the inferior alveolar nerve and vein. The mental branch emerges through the mental foramen (Fig. 6). Insertion of the pins one half inch above the lower border of the mandible will avoid endangering these structures.

The lingual artery is a branch of the external carotid artery and passes upward and

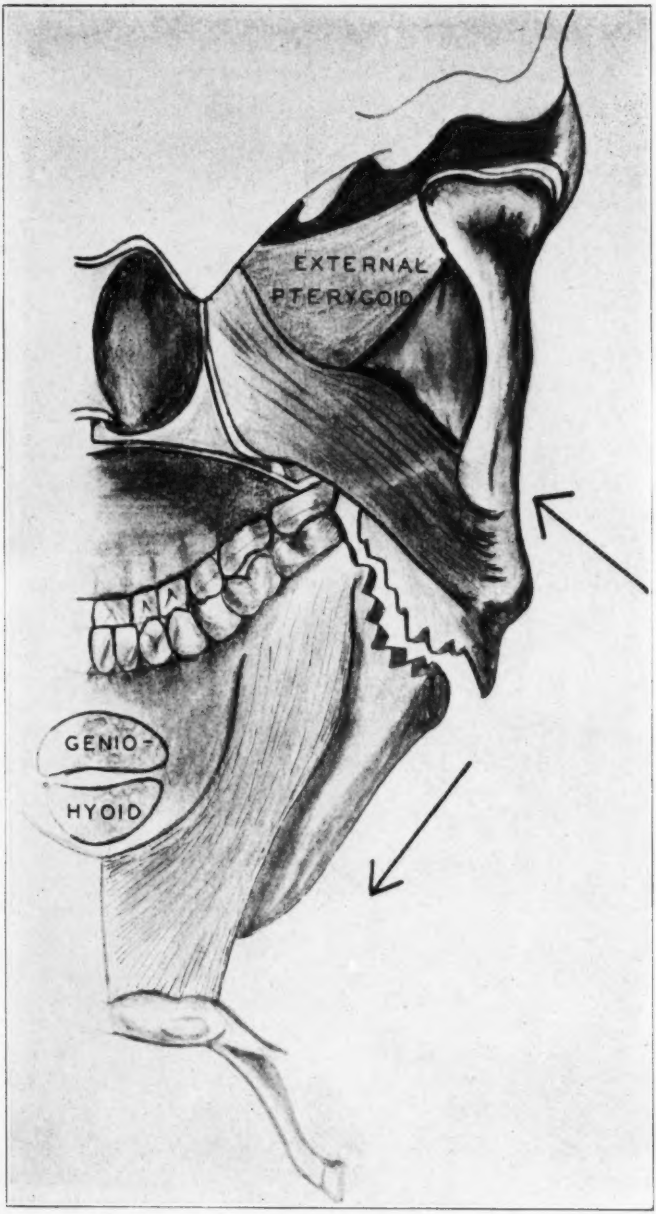

Fig. 3.—Directions of pull of internal pterygoid and mylohyoid muscles. Posterior-anterior view illustrates backward direction of fibers of internal pterygoid muscle. Its primary function is elevation of the mandible

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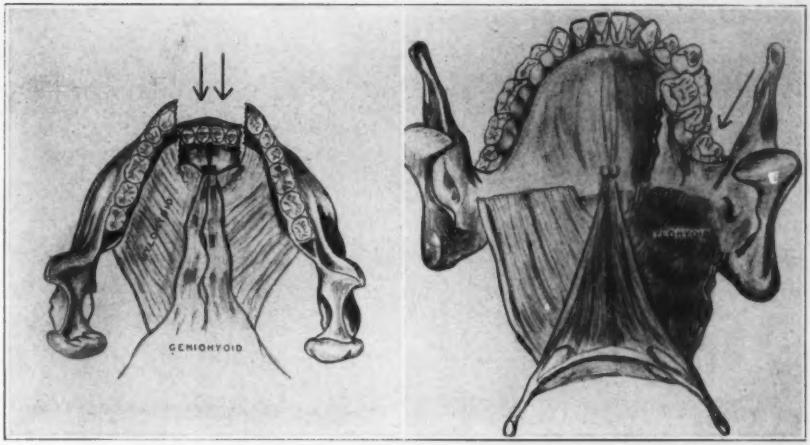

Fig. 4.—Left: Geniohyoid with digastric muscles attached beneath tend to pull anterior fragment of mandible downward and backward toward hyoid bone. Right: Mylohyoid muscle tends to pull fragment attached to it inward and downward

medially beneath the digastric and stylohyoid muscles to run horizontally forward, distributing branches to the tongue and neighboring muscles. The lingual artery may be avoided by not inserting the pins beyond the cortex of the medial plate of the mandible, thus avoiding the tissues of the floor of the mouth and these vessels.

Preoperative Procedure

Roentgen examination is the most accurate means for diagnosing mandibular fractures. At least two views should be taken, each at right angles to the other, to determine the line of fracture and the condition of the teeth. The examination should be made as soon as possible after the injury.[1] A case history should be obtained before the roentgen examination is made. The cause of the fracture, pathologic or traumatic, should be noted. While taking the history the dentist should detect any symptoms which might make the operation inadvisable.

Anesthesia

Careful attention should be given to the selection of the anesthetic agent and its application in management of fracture. The prime considerations are the safety of the patient, convenience to the operator and smooth administration for the anesthetist.[2] General anesthesia is indicated in multiple fractures and when complete muscular relaxation is desired. In the majority of cases of fractures general anesthesia gives better results and the patient is more satisfied. Local anesthesia is achieved by extra-oral mandibular nerve block (after the method of Labat) or by block injection of the inferior alveolar nerve. Preoperative medication is a highly important factor. During the manipulation of fractures an excessive flow of saliva is encountered which

1. Abt, E. L., Extraoral Roentgen Technique in Fractures of the Mandible, Maxilla and Associated Structures. *Am. J. Orthodontics* 29:409 (August) 1943.

2. Harang, H. L., Oral Surgery Anesthesia Safer and More Profound. *Anes. and Analg.* 25:211 (September-October) 1946.

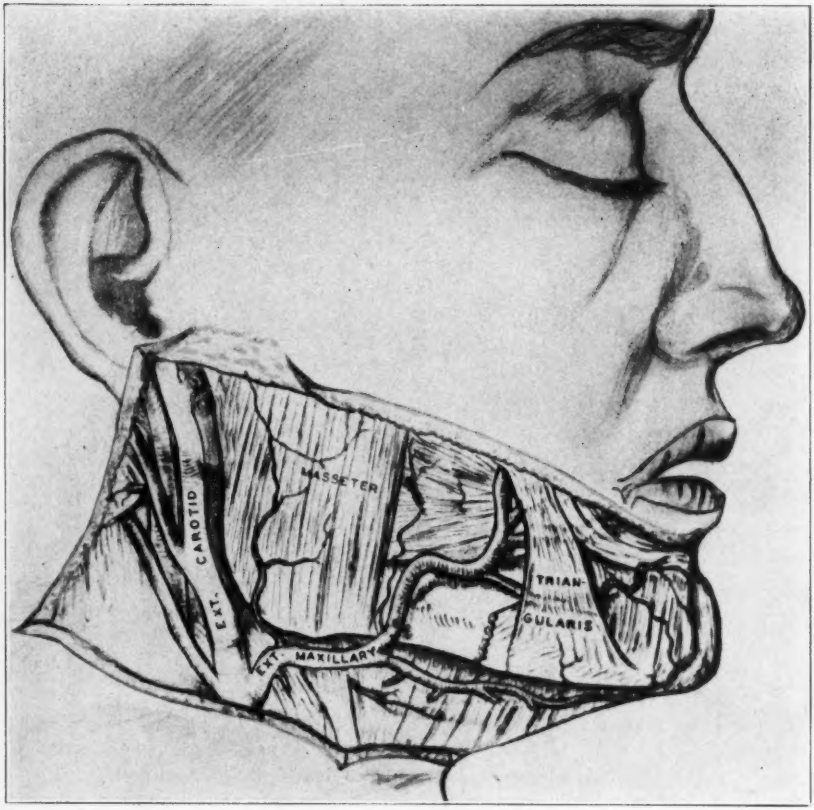

Fig. 5.—External maxillary artery crossing body of mandible

hinders the operation. Morphine sulfate grains ¼ and atropine sulfate grains 1/150 should be given forty-five minutes before the operation.

Operative Procedure

The patient's face is cleansed with tincture of green soap. Alcohol is applied followed by a skin antiseptic. The line of fracture is marked on the skin. The point of insertion of the pins on either side of the line of fracture is indicated, and the location of the external maxillary artery should be noted (Fig. 5). The pins should be placed above the inferior border of the mandible to avoid the alveolar nerves and vessels (Fig. 6). Stab wounds to the bone are made with a No. 11 Bard Parker blade at the same angle to the skin as the pin fixture directs. A surgical bur or the Brown Exolever may be used to pierce the cortical plate of the mandible.[3] This will guide and facilitate insertion of the pin. Caution must be exercised to prevent overheating of the bone by the drill and subsequent necrosis. The latest pin designed can be placed in the

3. Gross, P. P., Extra-oral Skeletal Fixation in Treatment of Mandibular Fractures. *Am. J. Orthodontics* 29:392 (July) 1943.

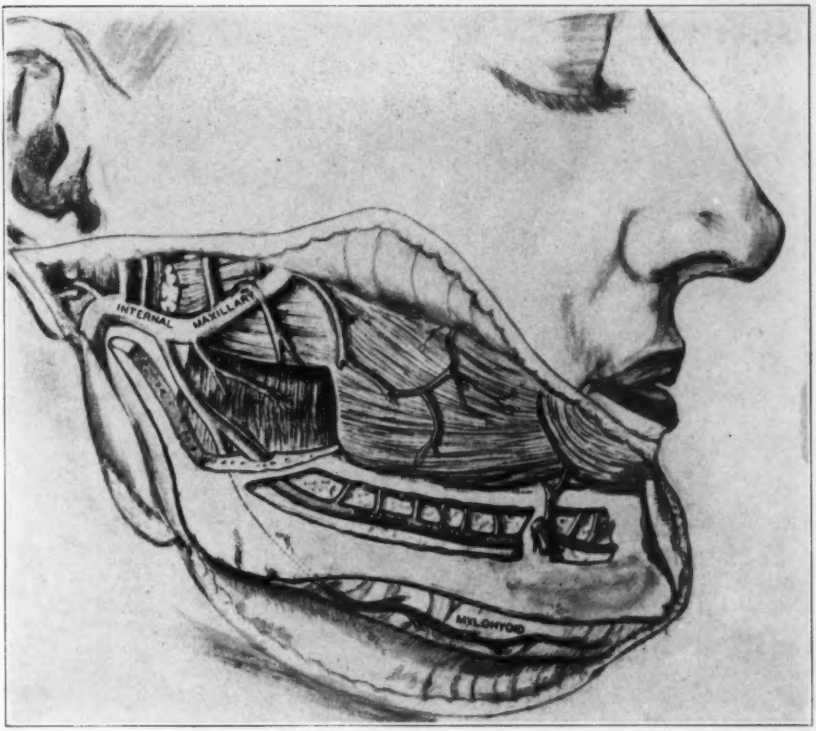

Fig. 6.—Section of mandible showing inferior alveolar artery in mandibular canal. This vessel is accompanied by the vein and inferior alveolar nerve

bone with little pressure. No preparatory hole is necessary. With proper support of the fragment the pin is inserted. It should engage the opposite cortical plate of bone but should not pierce the mucous membrane of the mouth. Excessive pressure during the insertion of large pins has a tendency to fracture the medial cortical plate.

After all pins are securely in position the fracture is reduced by intra-oral manipulation. Teeth in the line of fracture which prevent reduction should be removed.[4] With the alinement bar affixed, the nuts are tightened by hand. Roentgenograms and a careful examination of the occlusion of the teeth will guide the operator in accurate reduction. This final reduction should be obtained while the patient is still under the anesthetic.[5] The appliance is now firmly tightened in position.

Indication and Use

External fixation has a definite place in the treatment of mandibular fractures. Indications for its use are few, but it is the most satisfactory method when indicated. Disappointment and dissatisfaction in external fixation are caused by lack of strict asepsis and careful application.

4. Jacobs, M. H., Problem of Teeth in the Line of Fracture of the Mandible. *Am. J. Orthodontics* 29:102 (February) 1943.
5. Shaar, C. M., and Kreuz, F. P., *Manual of Fractures*. Philadelphia: W. B. Saunders Co., 1943, p. 49.

Fig. 7.—The Roger Anderson splint, of simple design yet highly applicable in fracture treatment. The edentulous patient has a bilateral fracture in the bicuspid region

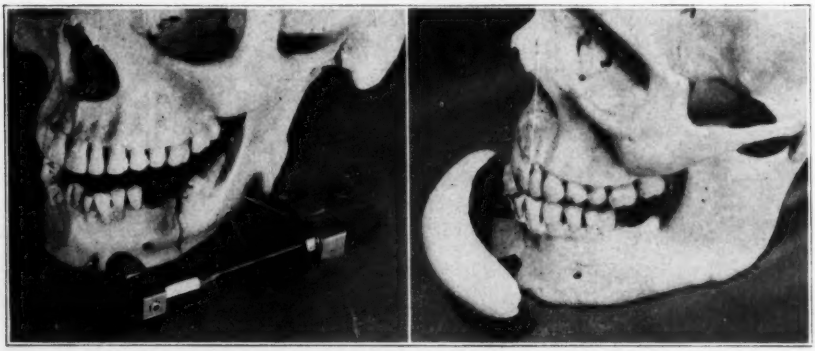

Fig. 8.—Left: The Stader splint uses a plastic pin bar to prevent electrolytic action between pins. Right: Plaster splint consists of Vitallium screws and plaster core. Simple construction makes this splint available to every dentist

The Roger Anderson splint is of ideal construction for the average fracture. Its simplicity is most advantageous. A universal wrench is used for all of the clamps. The

Fig. 9.—Patient wearing Vitallium splint of the Berry type. Its simple construction and ease of application make it valuable for single fractures

pin was perfected by Winter[6] and has proved to be ideal in size and threading (Fig. 7).

An electrolytic action between pins has been eliminated in the Stader splint by the use of plastic pin bars. The unit is comparatively light in weight yet of strong structure (Fig. 8, left). The Stader splint utilizes the Pilot-Reamer bone pin whose design applies several well established engineering practices. Heat production is reduced to a minimum; the reamer portion of the pin drills a smaller hole which is the exact size of the pin shaft, and the reamer serves as a guide to the depth of penetration of bone.[7]

The plaster splint was suggested by Bourgoyne.[8] It consists of Vitallium screws and a one inch bandage which is impregnated with plaster. The bandage is wrapped around the screw shanks and reinforced with plaster (Fig. 8, right). An advantage of the splint is its low cost. Adjustments cannot be made after the splint has been applied. In some cases this may be a disadvantage.[9]

The Vitallium jaw fracture appliance of the Berry type consists of Vitallium screws and a square alinement bar (Fig. 9). Holes are drilled using a seven-sixty-fourths-inch drill. When the pins are screwed into the holes a well is used to prevent the soft tissue

6. Winter, Leo, Fractures of the Mandible. *Am. J. Surg.* 61:367 (September) 1943.
7. General Electric X-Ray Corporation, *Application of Stader External Reduction and Fixation Splint*. P. 7.
8. Bourgoyne, J. R., Extra-Oral Splinting of Fractured Mandible. *J.A.D.A.* 30:1390 (September 1) 1943.
9. Godwin, J. G., Extra-Oral Plaster Splint Fixation in the Treatment of Fractures of the Mandible. *J.A.D.A.* 31:76 (January 1) 1944.

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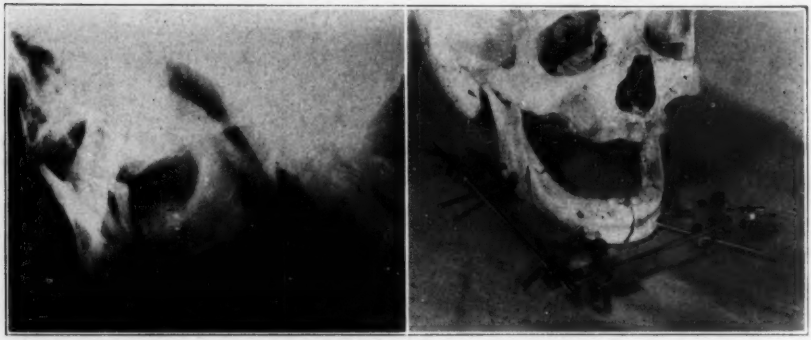

Fig. 10.—Left: Roentgenogram of patient in Figure 9 illustrates typical mandibular fracture before reduction. Right: The Thorold splint is completely universal in its joints. Pins are placed so that fragments, regardless of unit relation to each other, are readily connected by a strong threaded bar that affords adjustment of either traction or extension

from winding around the pin. An ordinary type screw driver, used to insert the pins, must be completely controlled to avoid its slipping and injuring the patient. The Berry splint has the advantage of using single pins in each fragment for maintaining the fixation.

A splint similar to the Berry type was perfected by Bigelow.[10] It consists of Vitallium screws with slotted heads, thumb nuts and an alinement bar.

The Thorold splint is more versatile than many others. The pin units attach to the fragments in any position in relation to each other and will assemble easily with the connecting bar for immobilization after reduction. The pins enter the bone with very little pressure, eliminating possible trauma to the ends of fracture fragments (Fig. 10).

Conclusion

1. Rigid fixation. There is a decrease in the occurrence of osteomyelitis when rigid fixation is obtained. If osteomyelitis is present rigid fixation is imperative for rapid recovery. External fixation will give ease of reduction and maintain complete immobilization.

2. Freedom of jaw movement. If complications such as vomiting and coughing exist external fixation will allow the necessary movement of the jaw. External fixation permits the patient to take a well-balanced and adequate diet. Since most patients are ambulatory early in treatment, adequate food is essential. Good oral hygiene can be maintained throughout the period of reduction. This is especially necessary in the event of complications in the oral cavity.

3. Cases of combined mandibular and maxillary fractures. If both mandible and maxilla are fractured external fixation is applied to the mandible and is supplemented by intra-oral fixation of the maxilla.

4. Cases of bone graft. In extensive surgical procedures involving the mandible, external fixation is indicated. In mandibular resections, space maintenance and plastic surgery external fixation proves to be the method of choice.

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10. Bigelow, H. M., Vitallium Bone Screws and Appliances for Treatment of Fracture of the Mandible. *J. Oral Surg.* 1:131 (April) 1943.

5. Cases of impaired respiration. Gunshot wounds cause a swelling of the tongue and throat, impairing respiration. Under such circumstances the external fixation proves applicable.

External fixation is not indicated for all fractures or conditions but is a successful method for treatment of fracture in selected cases.—*1400 South Fifth Street.*

IDEALS IN SURGERY

The real difficulty in inaugurating such a planned course of graduate training will be met with in the Department of Surgery itself. The idea that as members of the surgical staffs of teaching hospitals our most important duty is to train surgeons has not been appreciated by many and is an idea which requires propaganda to inculcate. The old plan of using internes and assistant residents as servants must be abandoned if we are to get good results. Indeed, I am convinced that even in many old established teaching hospitals a rebirth in the ideals and aspirations of the staff will be required before real progress is made. I suggest to you that the ideal of the teaching surgeon should be not how skillful and impressive he can make himself by constant practice and repetition, but how many young men he can train to be as good as or better than himself. Only when such an ideal is established can we hope to supply the needs of our country.

The difficulty is that busy surgeons often find it irksome to stand on the opposite side of the table assisting a young tyro in his first difficult operations. Too often they impatiently do the operation themselves or turn the job over completely and take no further responsibility for it. This, in my opinion, is poor teaching and is clear evidence that it is time for a change in the personnel of the staff. There is, of course, no excuse whatever for the old custom in which a star performer at some well known metropolitan hospital posts a list of operations for certain days in the week and does them all himself. Fortunately that sort of thing has almost passed away.

The truth is that in modern first class teaching hospitals the diagnosis should be made, the type of treatment selected and the operation performed by the resident staff under the constant guidance and supervision of their teachers. The attending staff should reserve for itself only special groups of cases on which they are conducting clinical research and those cases which obviously require more experience and skill than the assistant residents have so far acquired. These are the hospitals with huge lists of applicants and which attract the high honor graduates from near and far. Such hospitals are famous across the land for the quality of the men they produce.—W. Edward Gallie, in *Surg., Gynec. & Obst.* 84:513 (April 15) 1947.

TEMPOROMANDIBULAR ANKYLOSIS: REPORT OF CASE

Philip M. Northrop, D.D.S.,
Ann Arbor, Mich.

A young man, aged 17, was admitted to the hospital on March 9, 1943, with the chief complaint of inability to open his mouth (Fig. 1).

History.—The patient was first seen at the hospital in April 1929. He had chronic suppurative otitis media with mastoiditis and zygomatic abscess. Several operations had resulted in relief of symptoms of middle ear and mastoid diseases. Shortly after the onset of the otitis media, it was first noted that limitation of motion of the lower jaw began to develop. The patient returned in 1938, at which time diagnosis of ankylosis of the left temporomandibular joint was made. I performed arthroplasty, which permitted the patient to open his mouth well. However, gradual closure of the jaw was observed after about one year. The patient returned on March 9, 1943, for reconsideration of the ankylosis.

At the time of the arthroplasty a section was removed from the neck of the left condyle. The entire condyle was not removed. This case illustrates the importance of removal of a large section of the condylar neck, and preferably the condyle as well, if success is to be expected.

Examination.—The well developed young man had obvious micrognathia. He could open his mouth only 1 cm., the jaw deviating to the left side. The patient's oral hygiene was fairly good.

Roentgenograms demonstrated the old operative site through the neck of the left condyle. The condyle on that side was markedly enlarged and had not been removed at the time of the arthroplasty.

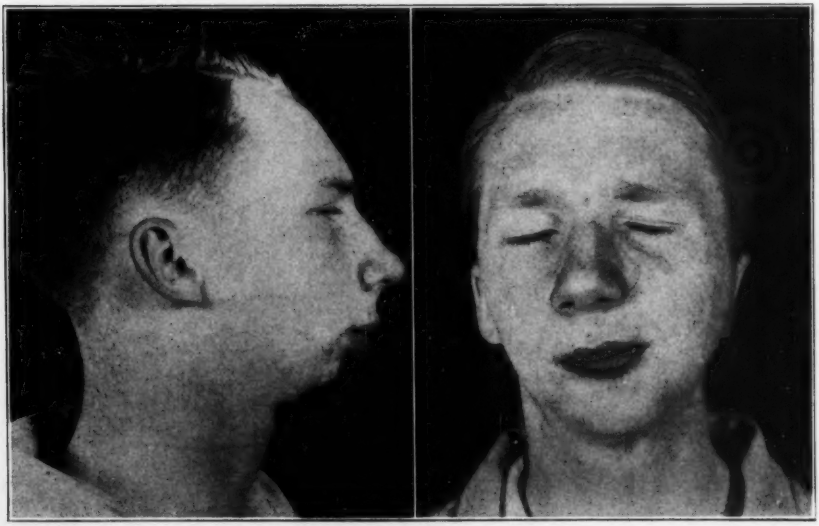

Fig. 1.—Preoperative appearance of patient

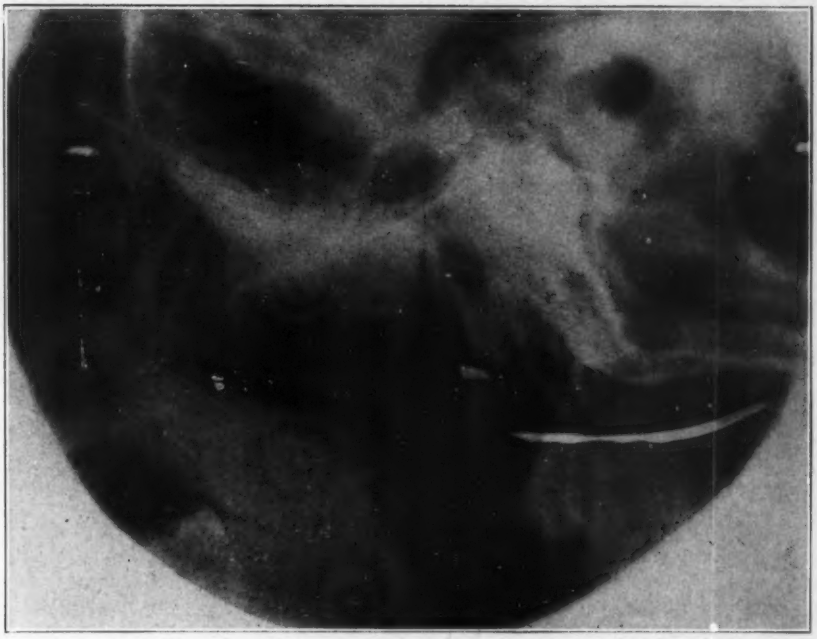

Fig. 2.—Extra-oral roentgenogram showing section to be removed from neck and head of condyle

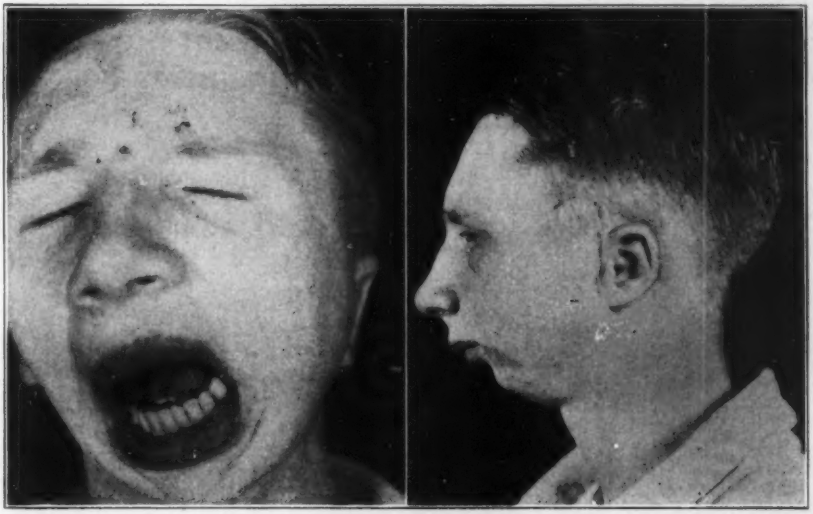

Fig. 3.—Postoperative appearance of patient

Diagnosis.—Postoperative ankylosis of the left temporomandibular joint; residual ankylosis of the left temporomandibular joint, and micrognathia.

Treatment.—It was felt that the ankylosed joint should receive further surgical treatment, and that at this time the condyle and a large section of the condylar neck should be removed (Fig. 2). Because of the marked recession of the mandible it was advised that after surgical procedures were carried out a cartilage transplant should be made in order to compensate for the patient's micrognathia.

Operation.—An anesthetic was administered to the patient endotracheally, and an incision, shaped like a question mark and placed further anteriorly than usual, was made so that the old scar line could be utilized and further scarring would not be necessary. The skin anterior to the line of incision was undermined, retracted and sutured forward out of the field. An incision was made through the subcutaneous tissue just posterior to the superficial temporal vessels. The tissues were retracted, and by blunt dissection the bone of the zygomatic ridge, condyle and neck of the condyle was exposed. The previously sectioned region had filled in with bone and dense fibrous tissue, resulting in the ankylosis.

With mallet and chisels, and especially with the Kerrison forcep, the entire neck and head of the condyle were removed. No fascia or temporal muscle was sutured into the large defect. The deeper tissue was sutured in layers, and the skin was closed and the margins were approximated with fine silk sutures after a rubber band had been inserted into the space and sutured in place. Gauze impregnated with Zeroform (bismuth tribrom phenate) was placed over the incision line, and a pressure bandage over the area.

Postoperative Progress.—The patient's convalescence was uneventful except for some swelling over the operative area. The patient was discharged one week after operation and asked to return in one month. He returned on May 3, 1943. The function of the mandible permitted him an anterior opening of approximately 3 cm. (Fig. 3). At this time a preserved cartilage transplant was performed.—*Department of Oral Surgery, University of Michigan.*

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COMPLICATED FRACTURE OF THE MANDIBLE: REPORT OF CASE

R. B. Rode, D.D.S.,
St. Louis

The patient, a young woman, aged 18, was seen for consultation ten weeks after she was injured in an automobile accident.

Examination.—A series of extra-oral roentgenograms which had been made at various times since the accident showed fracture at the angle of the mandible on both sides.

A lateral intra-oral roentgenogram of the left side showed an undeveloped third molar dislodged and turned in a distal direction. An occlusal roentgenogram showed that the third molar was still between the cortical plates (Fig. 1, left). The second molar was quite loose but responded to a test for vitality. There had been an opening just anterior to the angle on the outside of the jaw, but there was no suppuration either at the external opening or inside the mouth. The alinement of the teeth on this side was good, as was the occlusion.

There was an extensive bulging at the angle on the right side. The lateral roentgenogram showed that the undeveloped third molar had been pushed forward between the first and second molars. The occlusal view showed it to be on the buccal side, and a fragment of the buccal cortical plate of the mandible was pushed out buccal to the third molar. The longitudinal fracture extended posteriorly and apparently was separated completely. The occlusion on the right side was not normal, for the teeth in the mandible were lingual to those in the maxilla. There was an external opening on the right side at a point where the anterior border of the buccal fragment of the mandible apparently had penetrated during the accident. There was a fistulous tract extending from this opening into the mouth, and it was possible to pass a probe from the internal opening of the tract, which was in the tissue buccal to the third molar, down to the external opening. The patient gave a history of extensive purulent drainage from this opening for the previous five weeks (Fig. 1, center).

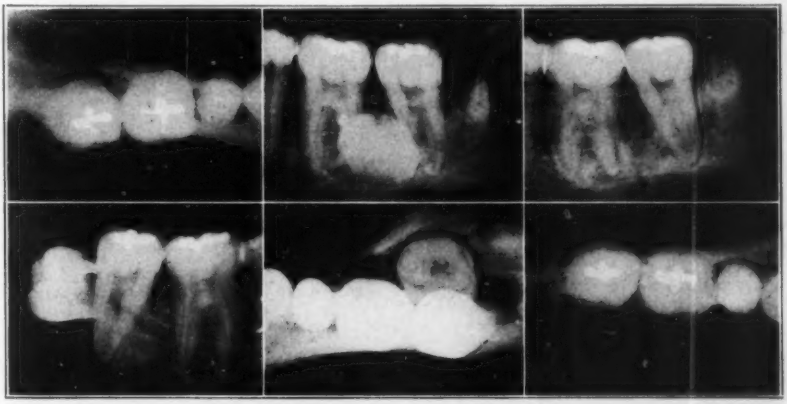

Fig. 1.—Left: Occlusal and lateral roentgenograms of lower left molar region, showing distal displacement of third molar. Center: Lateral and occlusal roentgenograms of lower right molar region, showing displaced third molar. Right: Lateral and occlusal roentgenograms of right molar region six weeks after operation, showing regeneration of bone

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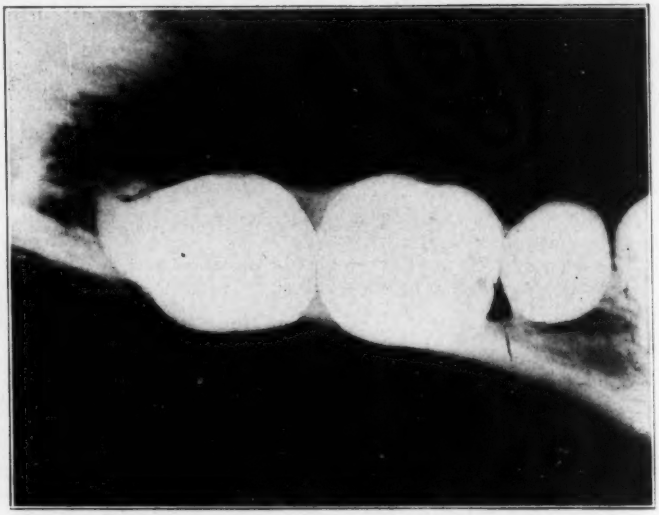

Fig. 2.—Occlusal roentgenogram of right molar region twelve weeks after operation, showing regeneration of bone

Operation.—The patient was hospitalized. With the patient under twilight sleep and local anesthesia, an incision was made buccal to the teeth in the mandible from the bicuspids posteriorly to what would normally be the third molar region. After the incision was made and the tissue retracted to expose the mandible and the displaced third molar, exploratory examination revealed that the third molar was attached to the portion of the buccal cortical plate that was displaced and pushed forward. The third molar and the sharp points of the buccal cortical plate were removed, and the lingual portion of the mandible containing the bicuspids and molar teeth was brought forward and buccally to be in apposition to the buccal portion of the mandible which was moved lingually so that union might take place after the teeth were in normal occlusion.

There was considerable swelling of the tissue around the site of the external opening. A linear incision was made on each side of the fistulous tract, and this section of tissue was removed. The fistulous tract was curetted of all necrotic tissue back to and into the opening in the mouth. A gauze drain was inserted in the external wound as well as in the operative field inside the mouth.

It was decided that no operative procedure should be instigated on the left side until healing had taken place on the right side and the union of the mandible was strong enough for operation. Whether the second molar would be firm again in the bone was questioned.

Postoperative Treatment.—Six weeks after the operative procedure on the right side the patient reported for examination. The fistula on the outside was healed completely, the tissues inside the mouth had returned to normal and occlusion was practically perfect. The roentgen examination showed regeneration of the osseous tissue and union taking place between the lingual portion of the mandible and the fragment of buccal cortical plate which had been rounded off and forced back into place after removal of the displaced third molar (Fig. 1, right).

Outcome.—Twelve weeks after the operation the patient reported again. Trismus had disappeared completely, and the roentgen examination revealed highly satisfactory regeneration of the osseous tissue (Fig. 2).—*518 Frisco Building.*

ROENTGENOTHERAPY OF MAXILLARY GIANT-CELL TUMOR

Paul H. Hamilton, D.D.S.,
Los Angeles

A woman, aged 47, was first seen in the dental clinic, June 20, 1944. She complained of slight elevation of the gingival tissues in the left maxillary incisor region, which for the previous six weeks had been painful to pressure from her upper denture.

History.—The patient had had no serious illness. Her teeth had been removed and replaced with full dentures ten years before her present complaint. Her father died at the age of 68 years. The cause of death was unknown. Her mother died as a result of an accident at the age of 48. The patient's five sisters were all alive and well.

Examination.—The patient was edentulous. There was a slightly raised area of the gingival tissues on the crest of the alveolar ridge in the left maxillary incisor region. This area had a bluish tinge. The remaining oral tissues appeared normal.

A roentgenogram of the involved area, taken on June 20, 1944, showed an erosion of the process to a depth of several millimeters, and evidence of infiltration of the soft tissue beyond this erosion (Fig. 1, left).

Examination of a biopsy section was reported to show benign giant-cell tumor.

Because the patient's blood pressure was 220/160 she was referred to the medical clinic for a complete diagnosis. Their findings were essential hypertension and aortic insufficiency.

Microscopic examination (Fig. 2) of a section taken from the gingiva at biopsy on June 22, 1944 was reported as giant-cell tumor lying just below the corium. It contained a moderate number of multinucleated giant cells of rather small size with from five to ten small centrally situated nuclei supported by abundant acidophilic cell bodies. The giant cells were encased in an abundant stroma composed of large fibroblasts with large nuclei. The corium overlying the tumor was unduly vascular. The overlying epidermis showed a marked irritative acanthosis.

Diagnosis.—Benign giant-cell tumor.

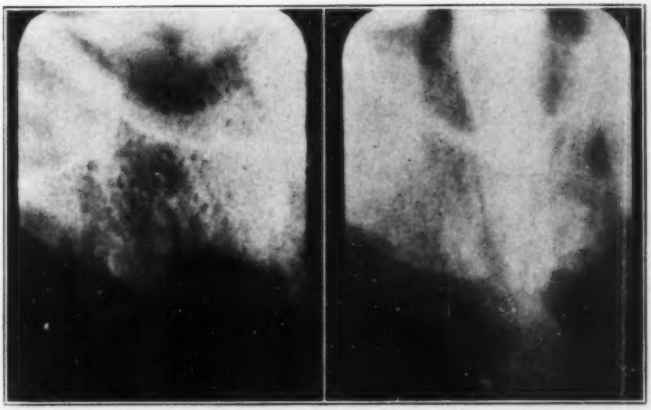

Fig. 1—Left: Preoperative dental film showing alveolar erosion caused by giant-cell tumor. Right: Dental film showing alveolus one year and eight months after treatment

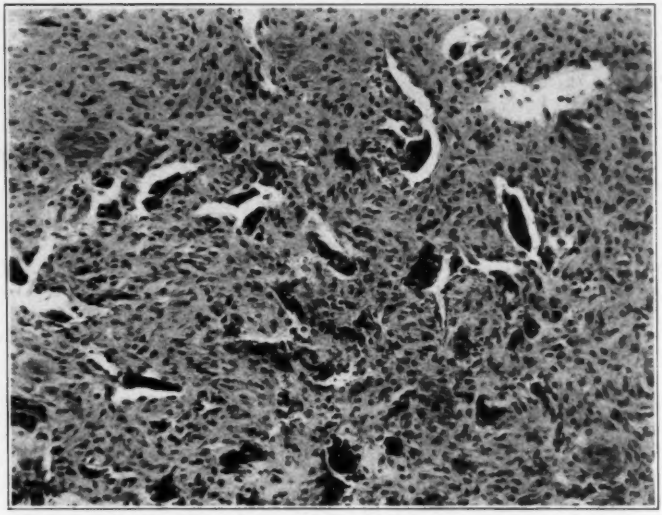

Fig. 2—Photomicrograph of giant-cell tumor

Treatment.—Because the giant-cell tumor was for the most part within the bone, the patient was referred to the roentgenologic clinic for treatment.

From July 7 to 20, the patient received 1,300 roentgens in air. Between August 25 and September 19, an additional 1,000 roentgens in air was given. All of this treatment was through a 2½ cm. circular portal directed at the tumor.

One month after roentgen treatment was introduced the color of the elevated soft tissue had returned to normal.

The elevated gingival tissue assumed normal contour in four months. Slight remineralization of the process was noted in five months.

Results.—Seven follow-up roentgenograms were taken between December 5, 1944 and March 13, 1946. By this latter date, one year and eight months after treatment, there was no evidence of disease in the treated area (Fig. 1, right), and the patient was using her dentures without difficulty.—*1200 North State Street.*

ABSTRACTS

Absorbable Gauze in Bone Surgery. R. Lattes, and V. K. Frantz, in *Ann. Surg.* 124:28, 1946.

This is a report of a series of experiments in which oxidized cellulose (absorbable gauze), fibrin foam and absorbable gelatin sponges were placed in cortical cavities or between the fragments of fractured bones of dogs.

By using the three substances in adjacent ribs of the same animal, individual variations in tissue reactions were eliminated as a source of error.

Osteogenesis was markedly retarded by the presence of absorbable gauze, but fibrin foam or absorbable gelatin permitted healing almost as rapidly as that seen in control defects. This interference with bone healing by absorbable gauze, whether it was placed in cortical defects, fracture lines, or in a bone from which a segment had been removed, suggested to the authors that it may be a valuable material for use in arthroplasties. Preliminary trials in this work have been encouraging.—Newton C. Mead, in International Abstracts of Surgery, *Surg., Gynec. & Obst.* 84:89 (January) 1947.

Facial Asymmetry and Malocclusion from Hyperplasia of the Mandible. J. B. Brown, LeR. Peterson, B. Cannon, and A. M. Moore, in *Plast. & Reconstr. Surg.* 1:284, 1946.

The authors report one case of facial asymmetry and malocclusion from hyperplasia of the mandible, and state that the condition occurs only rarely.

Progressive enlargement of the left side of the jaw with malocclusion was noted over a period of 5 years in a 27-year-old female. The asymmetry was due to an increase in length of the ascending ramus and also to thickening of the body of the left jaw. The entire left side was out of occlusion, the discrepancy being 6 mm. in the bicuspid and first molar area. No associated systemic disease was present.

The condyle and its elongated neck were removed through an external incision curved down from the temple close to the crux of the helix and over the tragus.

Elastic traction was attached to previously placed multiple loop wiring, and maintained for four weeks.

The teeth were brought into occlusion, and the deformity was removed. Mastication has been satisfactory.

On microscopic examination, the bony substance was found to be normal.—John R. Lindsay, in International Abstracts of Surgery, *Surg., Gynec. & Obst.* 84:529 (June) 1947.

Odontoma of the Nasopharynx. G. McClure, in *Arch. Otolaryng., Chic.* 44:51, 1946.

Odontoma of the nasopharynx with a deciduous tooth puts the growth in the classification of osteofibroma of dentigerous origin. The location of the growth was unusual, rare for this type of tumor. Careful search of the literature did not reveal a single case of odontoma of the nasopharynx. The origin of the growth could not be determined, but apparently the tumor sprang from the posterior ramus of the mandible. A tumor of this type when situated within the mandible or the maxilla appears to be completely separated from the surrounding bone by its capsule; therefore, one may assume that it had no attachment. The audiogram revealed a typical conductive hearing loss in the left ear, due either to complete obstruction or to absence of the eustachian tube.

The recurrence of the tumor was definitely due to a small portion of the capsule which remained in the extreme lateral part and contained tooth remnants in the bony structure with the power of regrowth. This regrowth is typical of odonoma, the second tooth presenting itself to the surface, in this case, the nasopharynx.

The recurrence of the growth and the formation of a second deciduous tooth definitely put the tumor in the classification of a compound composite odontoma.—Noah D. Fabricant, in International Abstracts of Surgery, *Surg., Gynec. & Obst.* 84:227 (March) 1947.

An Original Method of Correction of Hyperplastic Asymmetry of the Mandible. J. W. McNichol and A. T. Roger, in *Plast. & Reconstr. Surg.* 1:288, 1946.

The authors describe an original method for correction of this rare deformity.

Plaster models of the dental arches are made, and the existing occlusion recorded. The lower model is cut, is reduced in size if necessary by removal of teeth and repositioned so as to correct the facial deformity and produce functional occlusion. The sections of the lower model are united. It now indicates which teeth should be extracted and the best location for sectioning the mandible. The method of fixation of the mandibular fragments is decided. Sectional cast cap splints of German silver cemented to the teeth are usually best. Removable locks are prefabricated by making a plaster model of the lower arch with the splints on the teeth, and cutting and adjusting it with reference to the predetermined bite.

The first stage of operation consists in bilateral complete section of the mandible at predetermined points, the removal of full thickness section on the long side, together with associated teeth, and the removal of excess bone along the inferior margin of the mandible on the long side.

Although the mandibular nerves are sacrificed, the chances for continued function of the teeth are good.

The second stage of operation consists in the application of bilateral cancellous bone grafts to points of previous bilateral section 3 to 4 weeks after the first stage.

The third stage of operation is undertaken in from 5 to 6 weeks after the second procedure, at which time filling out of the concave side of the face by a soft tissue fat fascial dermal graft is accomplished.

The method described is believed to provide better functional occlusion and correction of facial deformity than simple resection of the head of the condyloid process on the affected side.

One case successfully treated by this method is described in detail.—John R. Lindsay, in International Abstracts of Surgery, *Surg., Gynec. & Obst.* 84:529 (June) 1947.

The Odontomes and Other Affections of the Jaws: Their Pathology, Diagnosis and Treatment. S. H. Wass, in *Guy's Hosp. Rep.*, London 95:21, 1946.

Among the odontomes (cysts, tumors, and malformations of the jaws arising from tooth germ) and the dental and dentigerous cysts, the adamantinomas or multilocular cysts are the more important ones, and are discussed as to pathology and clinical picture. Among other lesions, the osteoclastoma, osteitis fibrosa, osteomyelitis and actinomycosis are discussed and illustrated by roentgenographs and photographs of pathologic specimens, and roentgenographs of lesions of differential diagnostic importance (carcinoma) are presented.

In his discussion of treatment, the author stresses the necessity of complete removal even of the benign, noninflammatory lesions (except fibro-osseous tumors, in which cases complete removal is not essential) if recurrence is to be avoided.

The malignant lesions comprise the adamantinomas, epitheliomas of the alveolar process, metastatic carcinomas, and sarcomas. The author does not discuss the latter two lesions in detail. Epitheliomas respond mostly to irradiation. Adamantinomas are nonradiosensitive and require radical excision, followed by bone grafting, which may be a formidable operation in the aged. Curettement may be deemed preferable in some of these cases although it is inevitably followed by recurrence.

Radical operation, likewise, is the author's choice for osteomyelitis of the jaw, and neither bone drilling nor penicillin will prevent the spread of the disease. He states that even in late cases with much soft tissue swelling, delay is ill advised, and bold approach to the bone and radical and extensive excision is needed.

The author then elaborates on his experiences as to details of treatment. For malignancy of the upper jaw the classical excision of the maxilla is unsurpassed and for cysts and benign tumors the intra-oral approach is satisfactory. On the mandible, however, most all of the more extensive lesions are better approached from the outside. Such an approach gives better exposure and dependent drainage, and avoids severance of the mucosa. The author's discussion on the technic of approach should be read in the original.

Wass is impressed by the efficacy of orally administered penicillin in controlling intra-oral flora and postoperative infection when oral mucosa has been opened. Penicillin, given systemically, will not cure osteomyelitis of the jaws unless all diseased bone has been removed surgically. Penicillin can be used to good advantage preoperatively and postoperatively in cases of oral surgery.

An incision behind the ramus ascendens and below the ramus horizontalis of the mandible gives good cosmetic results if it heals by primary intention. There is danger of injury to a branch of the facial nerve and to the inferior dental nerve, the one resulting in objective, the other in subjective disturbances. Bone defects of the mandible usually reconstruct themselves rapidly and completely.—Heinrich Lamm, in International Abstracts of Surgery, *Surg., Gynec. & Obst.* 84:524 (June) 1947.

Fractures of the Malar-Zygomatic Compound: Treatment by Improved Methods and Myoplasty. M. B. Stewart and J. J. Conley, in *Arch. Otolaryng., Chic.* 44:443, 1946.

The authors review the history of fractures of the malar-zygomatic compound and discuss some of the more popular methods of treatment in use at the present time.

The symptoms and signs of a fracture of the malar-zygomatic compound are (1) pain; (2) periorbital swelling and depression or flatness of the face; (3) pain on mastication; (4) trismus, if the arch is involved; (5) intranasal hemorrhage on the injured side; (6) diplopia; (7) emphysema; (8) a palpable depression extending into the orbit; (9) subconjunctival hemorrhage, and (10) neurological changes resulting from damage to the infraorbital nerve.

The four principal sites of fracture correspond to the articulations; that is, (1) at the superior external orbital margin, (2) the region of the infraorbital foramen, (3) the zygomatic arch, and (4) the zygomatic process of the maxilla.

The authors mention the principal methods of treatment of simple depressed fractures of the zygomatic arch, the first method being that of Matas, in which a silver wire, passed under the zygomatic arch and twisted over an external padded splint, is used to hold the fragment elevated and in position.

Keen's intra-oral approach through the buccal fold over the upper second molar is described briefly. This consists of elevating the fractured arch and maintaining this reduction by means of a lubricated pack.

The method of Manwaring and Gill consists of elevating the fragments by grasping the zygomatic fragment with a medium sized towel clip and manipulating it into position.

The Gillies method, or temporal approach, is the method of choice. It consists of making a horizontal incision over the temporal muscle and passing an elevator beneath the temporal fascia under the zygomatic bone. The skull is padded and used as a fulcrum and the fragments are manipulated into position. Approximately 95 per cent of the fractures of the arch can be reduced by this method.

In the treatment of malar fractures, manipulation is more difficult, and fixation and traction are frequently required. The fragments are often impacted and reduction cannot be delayed as long as with a fracture of the zygomatic arch.

Roberts makes an incision over the malar eminence and elevates and manipulates the malar bone by using a corkscrew-like instrument.

Fixation of the malar bone can be accomplished occasionally by direct wiring with tantalum wire. When traction with external fixation is needed, a plaster of Paris headcap is constructed, and a screw eye is inserted through an external stab incision into the malar fragment and held in position for about a week.

Lothrop's method consists of the antral approach with elevation of the malar bone and packing of the antral cavity.

Associated fractures of the maxilla can be reduced without a cumbersome headcap by internal fixation with wire, this being placed through the orbital rim and through the soft tissues, to be fastened to the teeth. These wires are left for several weeks and are then removed by opening the original incision, cutting the wires and pulling them out through the mouth.

The author enumerates the more common complications of fractures of the malar-zygomatic compound. These are: diplopia, nerve injuries, hematoma of the maxillary sinus and con-

tracture of the masseter muscle. A special method of correction of the last named complication is described. This consists of a myoplasty in which three through-and-through transverse incisions are made in the masseter muscle at the zygomatic end, one of them being in the anterior third and one in the posterior third of the muscle at the point of attachment to the zygoma. The third incision is made through the middle third of the muscle at some distance below the first two. This allows for greater opening of the mouth.—Louis T. Byars, in International Abstracts of Surgery, *Surg., Gynec. & Obst.* 84:417 (May) 1947.

The Uses of Plastics in Surgery. G. Blaine, in *Lancet* 2:525, 1946.

Plastics are chemical substances of high molecular weight. They are deformable and under suitable conditions retain an acquired shape. They are versatile since the end product can be given different physical properties; for instance, some plastic might be made into a very hard object, a flexible mass, an adhesive film or even into a yarn. They doubtless will make new surgical procedures possible. Generally, they are grouped according to their physical and chemical behavior and divided into absorbable and nonabsorbable materials, according to living tissue reaction. A few interesting facts follow.

Of the plastics used in bone surgery, acrylics have been found most useful. Despite little reaction early, they tend to become loose, often after six months, although no tendency to "work themselves out" has been observed.

Acrylics are currently used with the "dental impression" technic. This necessitates a two-stage operation, the first stage being the taking of the impression, and the second the fitting of the prosthesis. The technical difficulties of this procedure led to the one-stage operation, which may be done in one of two ways. The first consists of the "setting" of "activated" acrylic dough by means of the ultraviolet ray. The second method makes use of the "thermoplastic" properties of the preformed unplasticized methyl methacrylate sheet. This sheet is heated to 130 C. and, while soft, is molded into the exact shape desired. This shape is retained on cooling. Either of these methods can be completed within 15 or 20 minutes.

Acrylic "jointcaps" have been used in the treatment of arthritis of the hip and in the reconstruction of the small joints of the hand. Acrylics have been used as spinal jackets and they have been used as Gunning splints in the treatment of fractures of the edentulous jaw.

Some of the disadvantages of acrylics are that the temperature at which the plastic is moldable is quite uncomfortable for the patient and the operator; they do not absorb moisture and therefore allow sweat to accumulate, pruritus to develop, and a foul odor to manifest itself. Occasionally, a severe dermatitis has resulted.

Acrylic contact lenses and artificial eyes do not break easily but are very easily scratched and are rather expensive. The polyvinyl plastic substances have been used as drainage tubes, for anesthetic airways and for soft tissue prostheses but they cannot be worn indefinitely and are photosensitive. Plastic chemistry has introduced the very popular "nylon" suture material.

The greatest use of the absorbable plastics has been in the field of hemostasis. Such articles as oxidized cellulose, fibrin foam and gelatin foams have proved of great value surgically.

The latest development in absorbable plastics is a derivative of seaweed, known collectively as the alginate group. Certain alginate products are absorbable in tissue, sterilizable by heat and compatible with penicillin. They have been found satisfactory as "puncture patches" over scleral defects. Alginate gels have been reported useful in the sealing of bronchi in surgical treatment of pulmonary tuberculosis.—Louis T. Byars, in International Abstracts of Surgery, *Surg., Gynec. & Obst.* 84:402 (April 1) 1947.

BOOK REVIEWS

Oral Surgery. By Sterling V. Mead, D.D.S., M.S., B.S. Third Edition. 1450 pages. 821 illustrations. Cloth. Price $15. St. Louis: C. V. Mosby Company, 1946.

The third edition of this voluminous and comprehensive text follows closely the excellent plan of the original edition published in 1933. Many of the chapters are practically identical with those in the original volume, but the lack of adequate reference to recently published material is unfortunate. In Chapter 3, "Preoperative Preparation," omission of a discussion of preoperative administration of penicillin or the sulfonamides for the prevention or control of complications associated with surgical procedures in the presence of acute infections is to be regretted. Thousands of our population who may be subject to acute suppurative conditions or subacute bacterial endocarditis after the extraction of teeth need such protection. The mode of action, limitations and methods of administration of the sulfonamides and penicillin are presented adequately in "Chemotherapy," Chapter 8.

A description of the fascial planes and spaces and a complete discussion of the infections involving these spaces are included in Chapter 14, titled "Infections of the Face, Neck and Floor of the Mouth." Better organization and revision of this chapter could have enhanced greatly the interesting and valuable information presented. In view of the advances in the treatment of syphilis, tuberculosis, actinomycosis, tetanus and hydrophobia, the omission of reference to recent material regarding these diseases is unfortunate. Inclusion of the experiences and final conclusions of the maxillofacial surgeons in World War II, proving that primary and delayed primary suturing with thorough but limited debridement is indicated in the prevention of undue scarring, deformity and a prolonged course of plastic surgical treatment, could have improved Chapter 16, "Wounds and Injuries."

Similar to that in earlier editions, the chapter devoted to fractures in general provides a useful introduction to the discussion of fractures of the maxilla and mandible, which is covered in the two subsequent chapters. Much more text should have been devoted to fractures of the upper jaw, in order to provide for an adequate discussion of the fundamental aspects of diagnosis, the changing concepts of the treatment of fractures at high level involving the cranium, the principles and types of numerous craniomaxillary appliances and methods of reduction and immobilization. A rearrangement of the references according to types of fractures and treatment of displacements would simplify matters for the reader.

The chapter on fractures of the mandible has been expanded greatly, although one of the most important advances in splintage developed in World War II—that of connecting plates and attachments secured by screws—has been omitted from the text. The fundamental surgical considerations of the treatment of mandibular prognathism should have been discussed more extensively in Chapter 32, "Malocclusion, Deformities and Malrelation of the Jaws." There is only one reference to work done more recently than 1937, in spite of all that has been written on the subject of prognathism during the past five years. Line drawings of surgical operations for retraction of the mandible do not illustrate the technics effectively because they are demonstrated on mandibles with fully developed bodies and rami.

The problem of diseases and affections of the nerves of the face deserves a much more thorough discussion than that given in Chapter 35. The bizarre types of pain, often associated with disease of the temporomandibular joint and which, at times, resemble the spasmodic pain of tic douloureux, are not mentioned, nor is the sensitivity of the patient to histamine, which is often an aid in the differential diagnosis of obscure facial pains.

John H. Fitz-Gibbon, Thomas L. Blair and Henry J. Tvrdy have contributed Chapter 41, "The Correlation of Surgery and Prosthesis in Orofacial Deformities." Oral surgeons will find this chapter of great service in planning the construction of prostheses with prosthodontists.—*C. W. Waldron.*

Oral Diagnosis and Treatment: A Textbook for Students and Practitioners of Dentistry and Medicine. By Samuel Charles Miller, D.D.S., F.A.C.D., associate professor in charge of the Periodontia Department, New York University College of Dentistry, New York, and thirty contributors. Introduction by Allen T. Newman, D.D.S., M.S. Second edition. Fabrikoid. 903 pages, 613 illustrations. Price $10. Philadelphia: Blakiston Company, 1946.

This outstanding book is a fine example of how a text covering an extensive field should be organized and prepared. Thirty contributors have cooperated to assure a fully adequate discussion of all aspects of the multitude of conditions seen in the oral cavity. The subject matter is well arranged and is presented with unusual clarity.

The science of oral and systemic diagnosis is stressed, and particular attention is given to clinical manifestations and technics of examination. Differential diagnosis is facilitated by the correlation in the text of clinical signs and symptoms with the disease or dysfunction. The numerous tables and outlines throughout the volume enable the reader to find readily the desired information on a particular subject.

Systemic conditions with oral manifestations receive proper emphasis, and the necessary descriptions are presented in a brief but effective manner with excellent illustrations. The essentials of treatment are summarized adequately, and the up to date "Bibliography and Suggested Reading" at the end of each chapter provides references whereby the reader may secure more detailed information on the treatment of a specific disease or condition.

The roentgenographic reproductions are excellent and in proper negative form. They are of great service in interpretation. Illustrations including photomicrographs are profuse and of excellent quality. Each chapter has its individual numbering system for its illustrations which will facilitate the publication of future editions.

Chapters of particular interest and value to the oral surgeon are: Chapter 2, on head pain, by R. J. Behan, M.D., assisted by B. J. Johnston, Jr., M.D.; Chapter 3, on pain of dental origin, by John Oppie McCall, D.D.S.; Chapter 6, on diseases of the oral mucous membrane, by George M. MacKee, M.D., and Anthony C. Cipollaro, M.D.; Chapter 7, on roentgenographic interpretation, by LeRoy M. Ennis, D.D.S.; Chapter 8, on diagnosis of the abnormalities of the temporomandibular articulation, by Sidney E. Riesner, D.D.S.; Chapter 9 on surgical conditions of the mouth, by Theodor Blum, M.D., D.D.S., and Theodore Kaletsky, D.D.S.; Chapter 20, on tumors of the oral mucous membrane, by George M. MacKee, M.D., and Anthony C. Cipollaro, M.D.; Chapter 21, on infections of the mouth and their relation to systemic disease, by Harold Stearns Vaughan, M.D., D.D.S., and Louis R. Burman, D.D.S., Ph.D.; Chapter 22, on diagnosis and treatment of diseases of the salivary glands, by Arthur J. Barsky, M.D., D.D.S.; Chapter 24, on oral manifestation of endocrine dysfunctions, by William Wolf, M.D., Ph.D.; Chapter 25, on oral and dental diseases of occupational origin, by J. A. Salzmann, D.D.S.; Chapter 26, on aerodontia, by Lt. Col. James M. Mullen, D.D.S.; Chapter 27, on laboratory tests in oral diagnosis, by Charles G. Darlington, M.D., revised by Louis R. Burman, D.D.S., Ph.G., and Oscar Miller, D.D.S., and Chapter 28, on bacteriology of the oral cavity, by Don Chalmers Lyons, D.D.S., Ph.D., M.S., revised by Julius Klosterman, M.D., Ph.D.

One hundred pages of a comprehensive index is a most excellent feature of the volume. This book is an invaluable text and should be a desk companion for every oral surgeon, dentist and physician.—*C. W. Waldron.*

Acrylics and Other Dental Resins. By Stanley D. Tylman, D.D.S., M.S., Professor of Prosthetics and Head of Crown and Bridge Department, University of Illinois, College of Dentistry, and Floyd A. Peyton, Ph.D., Assistant Professor of Dentistry, Department of Metallurgy, University of Texas, College of Dentistry. 480 pages, 440 illustrations, 2 color plates. Philadelphia: J. B. Lippincott.

This excellent book on synthetic resins is written in two parts. The authors, recognized authorities on their subjects, cover all of the accepted uses of synthetic resins in dentistry. The first part of the book is devoted to the chemical and physical nature of synthetic dental resins and related materials. In part two, the clinical application of synthetic resins and the technics involved in their use are discussed. A condensed discussion and an extensive list of references are included at the end of each chapter.

Oral surgeons will find in part two an excellent chapter on obturators for cleft palates, together with an analysis of the mechanical methods for correction of inoperable clefts by prosthetic means. The technics involved in taking the impression, preparing casts and models and processing the prosthesis are given in detail. The Fitz-Gibbon obturator is described and illustrated with an accompanying detailed description of the technic of its construction. The same is true of the Wright obturator. Both fixed and hinged types of the prosthesis are described.

Chapter 16 presents the details of construction of means for bite raising and also for surgical splints used in treating fractures. Chapter 17 is devoted to the prosthetic correction of the external ear. Chapter 18 deals with the technics of construction of acrylic eyes. Prostheses of the nose and restorations of the fingers, hands, toes, breasts and postpolio contours are discussed in Chapters 19 and 20. Details are given of the technics used in processing the restorations.—*C. W. Waldron.*

AN EXPERIMENTAL STUDY IN WOUND HEALING IN VITAMIN C DEPLETED HUMAN SUBJECTS

The study of wound healing has been the subject of much thought through the ages, but it is only in recent years that surgeons have become acquainted with tangible evidence concerning the value of certain systemically acting biochemical factors. Both clinical and laboratory observations have shown conclusively that the rate and efficiency of primary wound healing depend to a great extent upon vitamin C (ascorbic acid) content and the protein concentration in the tissues, while to a lesser degree upon carbohydrate and some mineral metabolism. Such conclusions have been drawn by eliminating the well known local deterrent factors of wound healing. There has been satisfactory laboratory evidence cited in the literature to prove the role played by vitamin C through animal experimentation, but the data obtained from clinical observations have been of necessity impure and incomplete.

Conclusions

1. Human subjects on prolonged ascorbic acid depletion exhibit an approximate 50 per cent diminution in tensile strength of healing wounds.
2. Such depletion delays the development of tensile strength in an uncomplicated healing wound from 3 to 5 days up to the fourteenth postoperative day.
3. When circumstances for healing are poor, such as the presence of undue wound tension or diminution in blood supply, this depletion in ascorbic acid is made more evident through gross failure of primary wound healing.
4. The incidence of wound infection under such circumstances suggests the need for ascorbic acid in the tissues for maximum resistance to infection by favoring primary wound healing.
5. Human subjects on prolonged ascorbic acid depletion exhibit a recognizable lack of collagen and reticulum in their healing wounds.—John A. Wolfer, Chester J. Farmer, Walter W. Carroll and Donald O. Manshardt, in *Surg., Gynec. & Obst.* **84**:1 (January) 1947.

PENICILLIN IN FRACTURE WOUND INFECTIONS

1. A method of topical application of penicillin in lubricating jelly in the treatment of established infection in compound fracture wounds is described. It has the advantage of maintaining high concentrations of penicillin in the area of the wound without the use of cumbersome technique or apparatus.

2. Evidence is presented of the effectiveness of this preparation in permeating the barriers in the zone of infection. This is in contrast to parenteral administration in which relatively small amounts of penicillin reach the area of suppuration.

3. Twenty-eight compound fracture wounds with established infection have been treated by this method. They had been refractory or slow in response to accepted methods of therapy for periods varying from 2 to 27 months, and all except 2 have shown a highly satisfactory response to treatment with penicillin jelly.

4. Delay in the healing of old infected compound fracture wounds is most frequently due to the presence of necrosed bone. The presence of devitalized bone sets up a vicious circle in the wound by encouraging infection which in turn causes further necrosis of bone. Penicillin jelly has proved itself to be effective in breaking up the vicious circle by eliminating or minimizing infection even in the presence of necrosed bone, and by inhibiting the soft tissue and bone infection after the sequestra are removed.

5. Skin grafting, secondary wound closure and healing by organization of blood clot have been successful in most instances in the patients in this series treated with penicillin jelly. From the author's experience and the experience of others, such procedures would seem to have been less successful without its use.

6. Topical penicillin therapy is to be considered as a part of a general plan of treatment. Good surgical judgment, proper surgical technique, maintenance of an optimum circulation in the injured part, and maintenance of a proper state of nutrition are absolute essentials in the treatment.—Weinberg, in *Surg., Gynec. & Obst.* 82:566, May 1946.